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**NATIONAL BUREAU OF STANDARDS
HANDBOOK H29
1942**

**SPECIFICATIONS, TOLERANCES, AND
REGULATIONS FOR COMMERCIAL WEIGHING
AND MEASURING DEVICES**

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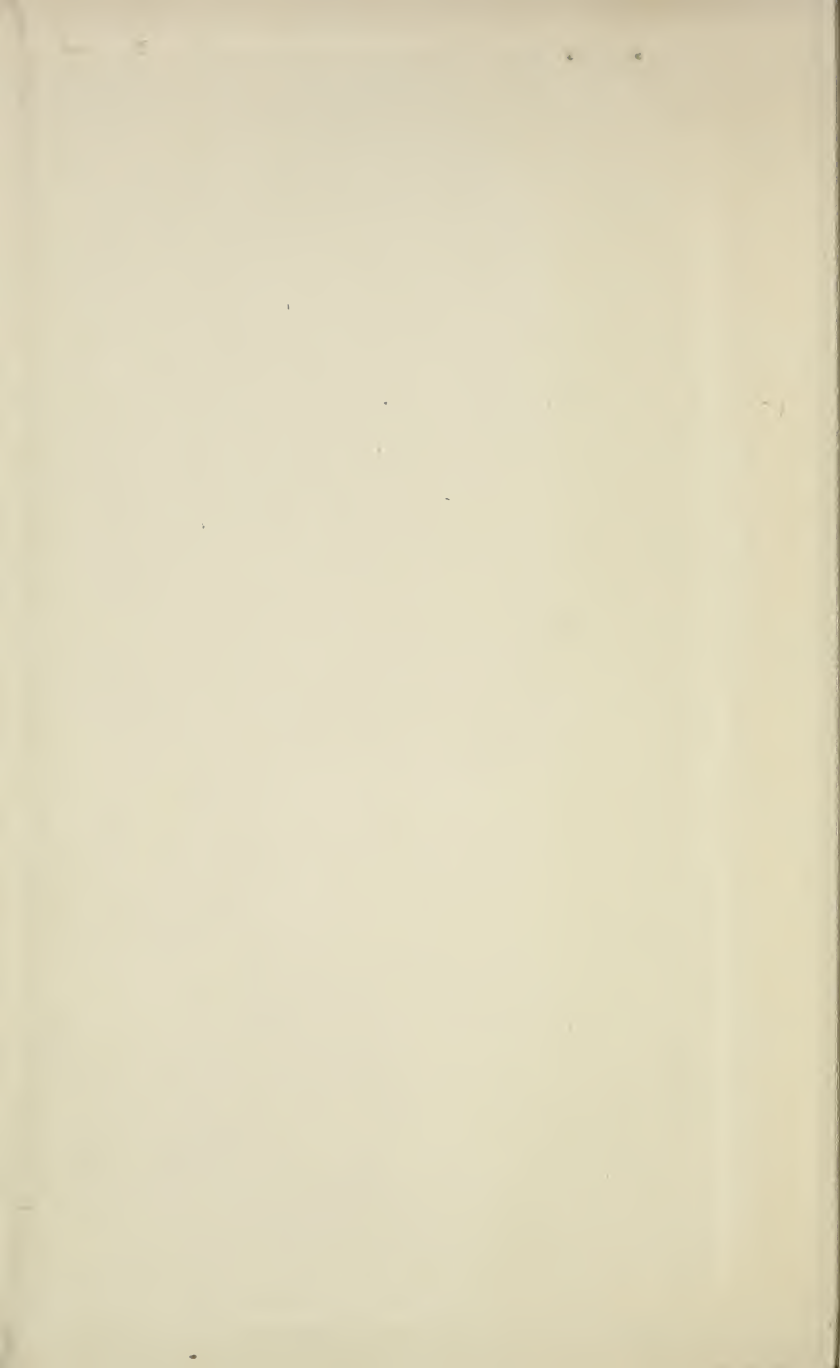
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No. 29

**UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL BUREAU OF STANDARDS**





1947 CORRECTION SHEET 5

NBS Handbook H29—Changes by 33d National Conference

SCALES—Continued

Handbook page 137. In Regulation K-1b strike out "AND LIVESTOCK" in the side title, and strike out "or a livestock scale" in the text, to make the Regulation read as follows:

K-1b. MINIMUM ON VEHICLE SCALES.—A vehicle scale shall not be used for weighing loads of less than 1,000 pounds. [1947]

Handbook page 137. Substitute for Regulation K-4, the following:

K-4. SUPPORTS AND LEVEL CONDITION.—A scale which is portable and which is being used on a counter or table or on the floor shall be so positioned that it is firmly and securely supported, and the scale shall be maintained in level. [1947]

Handbook page 138. Add a new Regulation, as follows:

K-12. STOCK RACKS.—A scale used for the weighing of livestock on the hoof shall be equipped with a suitable stock rack, that is, an enclosure, fitted with gates as required, within which livestock may be held on the scale platform during a weighing operation. The rack shall be securely mounted on the scale platform, and adequate clearances shall be maintained around the outside of the rack. [1947]

1947 CORRECTION SHEET 4

NBS Handbook H29—Changes by 33d National Conference

SCALES—Continued

Handbook page 95. Substitute for Specification B-2d, the following:

B-2d. DEVICE FOR ADJUSTING BALANCE OR LEVEL.—All mechanical devices for adjusting the balance condition or level of person-weighers and of small-capacity scales except cream-test scales and prescription scales, shall be of such construction that they are operable or accessible only by the use of some tool or device which is outside of and entirely separate from the device in question, such as a screw driver, wrench, etc., but not an adjusting pin. *The balance ball or equivalent device of a large-capacity scale shall not be rotatable and shall be actuated by a self-contained screw unless the balancing device is motor-controlled or is otherwise automatic in operation or is enclosed in a cabinet.* [1947]

Handbook page 102. Substitute for Specification B-2t (1), the following:

B-2t (1). GENERAL.—*The installation of any scale shall be such as to insure the necessary protection against wind and weather effects for the lever system and the under side of the platform. Adequate provision shall be made for access to the pit of a vehicle or livestock scale, for purposes of inspection and maintenance.* [1947]

Handbook page 107. Substitute for Specification C-2b, the following:

C-2b. READING FACE.—The reading face of a straight-face spring scale shall be firmly affixed to the frame at not less than three points: Provided, however, That this requirement shall not be construed to prohibit a scale properly equipped with a well-designed balancing means dependent for its operation upon limited, mechanically-controlled movement of the reading face with respect to the frame. [1947]

1947 CORRECTION SHEET 2

NBS Handbook H29—Changes by 33d National Conference

LIQUID-MEASURING DEVICES—Continued

Handbook page 63. Add a new Regulation, as follows:

8. LENGTH OF DISCHARGE HOSE.—The length of the discharge hose on any retail liquid-measuring device shall not exceed 15 feet, measured from the outside of the housing to the inlet end of the discharge nozzle, unless it can be demonstrated that a hose of greater length is essential to permit deliveries to be made to receiving vehicles or vessels. Unnecessarily remote location of a liquid-measuring device shall not be accepted as justification for an abnormally long discharge hose. [1947]

VEHICLE TANKS

Handbook page 78. At the end of Specification 17, substitute a colon for the final period and add a proviso, as shown below. [This new material is printed below in small type in order that it may conveniently be pasted in the margin or at the bottom of Handbook page 78.]

Provided, however, That the minimum operating rate for testing purposes on meters larger than 2 inches in size shall not be less than 20 percent of the manufacturer's maximum discharge rate as marked on the meter. [1947]

1947 CORRECTION SHEET 1

National Bureau of Standards Handbook H29

Changes Adopted by the 33d National Conference on Weights and Measures—1947

NOTE.—The corrections which follow have been so printed that the material may be cut and pasted either at the points where the corrections should be made or on the appropriate blank pages adjacent to the several codes.

SINGLE-SERVICE MEASURE-CONTAINERS (EXCEPT MILK BOTTLES)

Handbook page 39. In Specification 1, following the expression " $\frac{1}{4}$ pint" insert "(1 gill, 4 fluid ounces)", so that the specification will read:

1. CAPACITY.—Measure-containers shall not be subdivided and shall be of one of the following capacities only: 1 gallon, $\frac{1}{2}$ gallon, 1 quart, 1 pint, $\frac{1}{2}$ pint, and $\frac{1}{4}$ pint (1 gill, 4 fluid ounces), standard liquid measure. [1947]

LIQUID-MEASURING DEVICES

Handbook page 51. Substitute for the last five lines of the third paragraph of Specification 6, the following:

in the case of wholesale devices the value of the minimum rate shall not exceed 20 percent of the manufacturer's marked maximum discharge rate. [1947]

Handbook page 62. Substitute for the Note following Specification 53, the following:

NOTE.—It is recommended that the capacity of the standard measure used for the testing of a wholesale meter be equal to at least the amount delivered in one minute by the meter at its maximum rate of delivery. [1947]

UNITED STATES DEPARTMENT OF COMMERCE

JESSE H. JONES, Secretary

NATIONAL BUREAU OF STANDARDS

LYMAN J. BRIGGS, Director

NATIONAL BUREAU OF STANDARDS HANDBOOK H29

Superseding Handbook H22

**SPECIFICATIONS, TOLERANCES,
AND REGULATIONS
FOR
COMMERCIAL WEIGHTS AND MEASURES
AND
WEIGHING AND MEASURING
DEVICES**

(Issued September 26, 1942)



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PREFACE

This Handbook supersedes Handbook H22 of the National Bureau of Standards, published in 1938, and presents the specifications, tolerances, and regulations adopted by the National Conference on Weights and Measures through the Thirty-first Conference held in 1941. These codes are recommended by the National Bureau of Standards for promulgation by the States.

LYMAN J. BRIGGS,
Director, National Bureau of Standards.

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REPORT

ON THE

PROGRESS OF THE

WORK OF THE

COMMISSION

FOR THE

SPECIFICATIONS, TOLERANCES, AND REGULATIONS

FOR

COMMERCIAL WEIGHTS AND MEASURES AND WEIGHING AND MEASURING DEVICES

AS ADOPTED BY THE

NATIONAL CONFERENCE ON WEIGHTS AND MEASURES

AND RECOMMENDED BY THE

NATIONAL BUREAU OF STANDARDS FOR ADOPTION BY
THE SEVERAL STATES

Part I.—INTRODUCTION

Source.—The specifications, tolerances, and regulations published herein comprise, in their latest form, all of the current codes as adopted by the National Conference on Weights and Measures,¹ the latest action reported having been taken by the Thirty-first National Conference on Weights and Measures in 1941. The Conference Committee on Specifications and Tolerances,² acting at the request of the Conference or upon its own initiative, prepares from time to time, with the cooperation of the National Bureau of Standards, proposed amendments or additions to the ma-

¹ The National Conference on Weights and Measures is a body made up of State and local weights and measures officials from all parts of the United States, which normally meets annually at the National Bureau of Standards, Washington, D. C. For a more detailed description of the Conference and its activities, see chapter 12, National Bureau of Standards Handbook H26, *Weights and Measures Administration*. Copies of that publication may be purchased from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 75 cents each.

² A standing committee of the National Conference, consisting of five members. The present chairman of the Committee is John P. McBride, Director of Standards and Necessaries of Life, State of Massachusetts (Boston); the Secretary of the Committee is R. W. Smith, National Bureau of Standards (Washington, D. C.).

terial previously adopted by the Conference; such amendments or additions are then presented to the Conference as a whole, where they are discussed by weights and measures officials and representatives of interested manufacturers or industries; eventually the proposals of the Committee, which may have been amended on the floor, are voted upon by the weights and measures officials, a majority vote being required for adoption. It is the practice to adopt tentatively new codes and major changes in existing codes, final action being deferred at least until the succeeding Conference; sometimes a code will retain its tentative status for a longer period.

All of the specifications, tolerances, and regulations given herein are recommended by the National Bureau of Standards for official promulgation in and use by the several States in exercising their control of commercial weighing and measuring apparatus; a similar recommendation is made with respect to the local jurisdictions within a State, in the absence of the promulgation of specifications, tolerances, and regulations by a State agency.

Purpose.—The purpose of specifications and tolerances is to eliminate from use, without prejudice to apparatus which conforms as closely as practicable to the official standards, weights and measures and weighing and measuring devices which are false, which are of such construction that they are faulty—that is, which are not reasonably permanent in their adjustment or will not repeat their indications correctly—or which facilitate the perpetration of fraud.

The purpose of regulations³ is to control certain specific and important aspects of the procurement and use of commercial weighing and measuring apparatus, to the end that apparatus may be properly selected, installed, maintained, and used. Regulations are directed primarily to the user of apparatus, as distinguished from specifications and tolerances which are directed primarily to the manufacturer of apparatus.

Application.—The specifications and tolerances given herein are intended to apply to weights and measures and weighing and measuring devices used in commercial transactions.

³ The principle of the grouping of certain requirements under the heading "Regulations" was first adopted by the Twenty-fourth National Conference on Weights and Measures (1931). See pages 83 to 85 of the Report of the Twenty-fourth National Conference on Weights and Measures, NBS Miscellaneous Publication, M129.

With respect to any particular commercial device the specifications and tolerances are to be construed as being fully applicable whenever such a device falls clearly within one or more of the several classes of apparatus specifically considered. They shall also be construed to apply to other apparatus, such as that used for special purposes, whenever and insofar as they are clearly applicable, but not otherwise.

Classification of Specifications.—Two classes of specifications are established:

1. Retroactive specifications (printed in ordinary roman type) which are to be enforced with respect to all commercial apparatus in use.

2. Nonretroactive specifications (printed in *italics*) which are to be enforced only with respect to apparatus which is manufactured in or brought into the State after the promulgation of the specifications therein, and which are not to be enforced with respect to apparatus which is in the State at the time of such promulgation, either in use or in the stock of manufacturers of or dealers in such apparatus.

This classification is made in order that the requirements may be put into force and effect without unnecessary hardship and without wholesale condemnation of apparatus which, while not of the best construction, is nevertheless fairly satisfactory and may be used for some time without greatly prejudicing the rights of purchasers. The retroactive specifications are those which are most urgently required and with which all apparatus should at once be required to conform; the nonretroactive specifications are those which, while clearly desirable, are less vital, and which, as a matter of expediency in enforcement, may reasonably be suspended with respect to apparatus already within the jurisdiction.

The principles outlined in the preceding paragraph should be observed in the case of a jurisdiction initially promulgating either a single code of specifications relating to a class of apparatus not formerly so regulated, or a series of such codes. It is not to be expected, however, that nonretroactive specifications shall always remain nonretroactive; in a given jurisdiction it is entirely proper that a weights and measures official, following a careful analysis of existing conditions, fix reasonable periods for the continuance of the nonretroactive application of particular specifications, at the expiration of

which periods such specifications will become retroactive in their application. These periods should be of such length as to avoid undue hardship on the owners of apparatus and, in the case of some specifications, should approximate the average useful life of the apparatus in question. The periods will, of course, differ for different apparatus, and may differ for different specifications in the same code.

In order that all parties at interest may have timely and ample notice of impending changes in the status of specifications, the date or dates at which nonretroactive specifications are to become retroactive should be published in combination with the code itself if sufficient data are then at hand to make such action feasible; otherwise, equally effective notice should be given at the earliest practicable date.

It is obvious that, as presented herein, the nonretroactive character of specifications originally so classified, must be shown, regardless of the time which may have elapsed since their adoption, for the guidance of officials in jurisdictions in which weights and measures supervision is being inaugurated or shall be inaugurated in the future. It may well be that in jurisdictions in which the older codes were promulgated some years ago, the time has now arrived when many of the originally nonretroactive requirements may, after due notice, properly be applied to all apparatus within the jurisdiction.

In order to enforce the specifications, it will be necessary to be able to distinguish that apparatus to which the nonretroactive specifications do not apply; that is, that apparatus which was in the State, either in use or in the stocks of manufacturers or dealers, at the time of promulgation of the specifications. This may be accomplished as follows: At the time of the first examination of apparatus, all devices encountered, and sealed, as the result of an accuracy test and an inspection involving the application of the retroactive specifications only, may be permanently and clearly stamped in a prominent position, preferably near the seal, with a steel die bearing a star (*) or some other simple design. Not only apparatus in use but also that in the stocks of manufacturers and dealers should be marked as described. After the first examination, all apparatus not so marked will be subject to all of the specifications, both retroactive and nonretroactive,

while the apparatus marked with the special stamp will continue to be exempt from the provisions of the nonretroactive specifications and will be regulated only by the retroactive ones.

Classification of Tolerances.—A tolerance is a value defining the amount of the maximum allowable error or departure from true value or performance. Two classes of tolerances have been established:

1. Manufacturers' tolerances, or the tolerances applicable to new apparatus.

2. Users' tolerances, or the tolerances applicable to apparatus in use.

This classification is made because, in general, apparatus will necessarily deteriorate after being put into use and used for some time, and it would be manifestly unjust to reject or condemn, shortly after it is put into use and used, apparatus which was satisfactory when sold. It might so happen that the new apparatus had been just within tolerance when it was approved; it is obvious that but very little use might be necessary to throw the error on such apparatus outside the tolerance; therefore such a piece of apparatus would have an unreasonably short commercial life before rejection for repairs if it were not for the larger tolerance for apparatus in use, such as has been provided.

After weights and measures territory has once been covered it is customary to consider as "new" all apparatus which is subsequently being tested for the first time by the official, and to apply to such apparatus the manufacturers' tolerances. It is likewise customary to apply the manufacturers' tolerances in many cases when retesting apparatus which has been rejected and which has subsequently been adjusted or repaired, for the same reasons as have been outlined above.

It may also be mentioned that there are certain types of apparatus with respect to which the general principle of loss of accuracy with use does not apply, such as graduated glassware, milk bottles, etc. Therefore in the tolerances which are given hereafter it will be observed that in certain instances but a single tolerance is specified. Wherever no mention is made of manufacturers' tolerances, it is to be understood that the same tolerance applies to new apparatus and to apparatus in use.

Where two classes of tolerances are specified, the manufacturers' tolerances are usually one-half the users' tolerances; since the latter will be employed more frequently than the former, the values appearing in the tolerance tables which are given hereafter are the users' tolerances.

Accurate and Correct Apparatus Defined.—A weight or measure or weighing or measuring device is to be considered "accurate" when it conforms to the standard within the applicable tolerances. When apparatus fails so to conform, it is to be considered "inaccurate."

A weight or measure or weighing or measuring device is to be considered "correct" when, in addition to being accurate, it conforms to all of the applicable requirements of the appropriate code. All other apparatus is to be considered "incorrect."

See page 148 of this Handbook for note relative to Correction Sheets.

PART II.—SPECIFICATIONS, TOLERANCES, AND REGULATIONS

Apparatus in the Metric System.—No specifications contained in the following pages shall be understood or construed to prohibit the sale or use of weights or measures or weighing or measuring devices constructed or graduated in units of the metric system.

The tolerances to be allowed on any weight or measure or weighing or measuring device constructed or graduated in units of the metric system shall be equivalent to those specified on similar apparatus constructed or graduated in the customary system.

Specifications printed in roman type are retroactive, and apply to all apparatus.

*Specifications printed in italics are nonretroactive and apply only to apparatus manufactured in or brought into the State after the date of promulgation of the specifications.*⁴

LINEAR MEASURES

SPECIFICATIONS

1. Measures of length shall be made of a material the form and dimensions of which remain reasonably permanent under normal conditions—for example, steel, brass, hardwood, etc.

2. *The ends of measures of length made of wood, or of other nonmetallic material liable to wear away through use, shall be protected by some metal not softer than brass, firmly attached to the measure.*

3. Rigid measures of length shall be smooth and straight.

4. Folding measures of length shall be so constructed that each section will come to a definite stop when straightened out.

⁴ See Classification of Specifications, p. 3.

5. Measures of length shall be graduated in units of the customary system and its usual subdivisions.

6. All graduations shall be clear and distinct, and the main graduations shall be plainly designated. The length of these main graduations shall be greater than that of the intermediate graduations, and the latter shall be varied in length in such a way that they may be conveniently read. Main graduations are to be construed as those the value of which should be readily ascertainable in order to facilitate reading at any point.

7. *Graduations shall not be greater in width than one-quarter of the value of the smallest subdivision: Provided, however, That if line graduations are employed, their width shall not exceed 0.03 inch; if raised graduations are employed, their width shall not exceed 0.12 inch at their widest point.*

8. All graduations shall be uniformly spaced and be perpendicular to the edge of the measure.

TOLERANCES

The tolerances to be allowed in excess or deficiency on all measures of length, except tapes of steel or other metal, shall be the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new measures of length, except tapes of steel or other metal, shall be one-half of the values given.

Length	Tolerance
<i>Feet</i>	<i>Inch</i>
6-----	3/16
5-----	5/32
4-----	1/8
3-----	3/32
2-----	1/16
1-----	1/32
1/2 or less-----	1/64

The tolerances to be allowed in excess or deficiency on all tapes of steel or other metal shall be the values shown in the following table:

Length	Tolerance	Tension
<i>Feet</i>	<i>Inch</i>	<i>Pounds</i>
100-----	1/4	10
66-----	3/16	10
50-----	1/8	10
33-----	3/32	10
25-----	1/16	10
10-----	1/16	5
6-----	1/32	5
3-----	1/32	5

REGULATIONS

1. Measures of length, so called, defined by tacks driven into a counter, or in any similar way, shall not be allowed.

FABRIC-MEASURING DEVICES

DEFINITION

A retail fabric-measuring device, hereinafter referred to as a fabric-measuring device, is a mechanism or machine which is adapted to measure and to indicate automatically the length of fabric passed through it, and which, on account of the character of its primary indicating elements, is obviously designed for use in connection with retail sales; such devices may or may not be designed to indicate automatically the total price of the amount of material measured, for a series of unit prices.

SPECIFICATIONS

1. BASIS OF GRADUATION.—Fabric-measuring devices shall be graduated in units of the customary system and its usual subdivisions. The maximum value of the minimum length graduations on fabric-measuring devices shall be $\frac{1}{8}$ yard.

2. CHARACTER OF GRADUATIONS.—The length graduations and the value graduations on all fabric-measuring devices shall be clear and distinct and their length shall be so varied or they shall be so arranged that their meaning or value is readily apparent and their indications may be conveniently read. The width of any graduation mark shall in no case be less than 0.008 inch.

3. INTERVAL BETWEEN GRADUATIONS.—The clear interval between $\frac{1}{8}$ -yard graduation marks on fabric-measuring devices shall not be less than $1\frac{1}{16}$ inch (0.6875 inch); if inch graduation marks are employed the clear interval between such inch graduation marks shall not be less than $\frac{1}{8}$ inch (0.125 inch). These values shall be applied to the most sensitive indicating element with which the device is equipped.

The clear interval between value graduation marks on fabric-measuring devices shall not be less than 0.02 inch.

4. COMPUTING CHARTS.—Computing charts may be made in accordance with either of the following principles:

(a) If the device is so designed and constructed that it purports automatically to compute for a series of unit prices the total price for every length within the range of the device,

then the device shall be equipped with a value pointer or indicator and value graduation marks; the value graduation marks shall be correctly placed; and in any position which the indicator or pointer and the chart may assume there shall be exposed to view a sufficient number of value figures and graduations to permit the value indications of the device to be read correctly. The value graduations shall not exceed 1 cent at all prices per yard up to and including 30 cents. At any higher price per yard the value graduations shall not exceed 2 cents: Provided, however, That nothing in the above shall be construed to prevent the placing of a special value graduation to represent each 5-cent interval. These special graduations may take the form of dots, staggered graduations, or similar forms. They shall be so placed that their meaning and value may be clearly understood, but they shall not be placed in the space between the regular graduations.

(b) If the device is so designed and constructed that it purports automatically to compute only for lengths corresponding to a definite series of length graduations, then there shall be no value graduation marks, and at no position which the chart may assume shall two value figures for the same unit price be completely and clearly exposed to view at the same time. One of the following alternatives shall also be complied with:

(1) There shall be a value computation for each length graduation throughout the range of the device; or

(2) No value indication may be exposed to view except at such times that the device registers a length indication for which a correct value indication is provided; or

(3) Each column or row of value graduations shall be clearly and conspicuously marked with the length graduation to which the values correspond, the device shall be marked with the character and limitations of the computations made, and there shall be a computation for at least each $\frac{1}{8}$ yard throughout the range of the device.

All money values corresponding to definite length graduations must be mathematically correct except as follows: If the mathematically correct amount includes a fractional part of a cent, the fraction shall be dropped if it is less than $\frac{1}{2}$, but if the fraction is $\frac{1}{2}$ or more the next higher cent may be shown.

5. **POINTERS AND INDICATORS.**—Each pointer or indicator used in a fabric-measuring device shall be so designed and constructed that a clear, distinct, and accurate reading is given. All pointers or indicators shall be symmetrical about the graduation marks at which they may stand and shall reach to all such graduation marks. The width of the pointer or indicator, or of the end thereof, shall not exceed the width of the smallest graduation marks on the scale with which it is used, and in no case shall such width exceed 0.015 inch. The distance between the pointer or indicator and its scale or chart shall not exceed 0.06 inch.

6. **READABILITY OF INDICATIONS.**—Fabric-measuring devices shall be so designed and constructed that in any position which the length indicator or pointer and scale or chart may assume in their operation, there will be exposed to view a sufficient number of figures and graduations readily to permit the length indications of the device to be read correctly.

7. **RETURN OF INDICATING ELEMENT TO ZERO.**—Fabric-measuring devices shall be so designed and constructed that the indicating elements used in registering lengths or prices of deliveries to individual purchasers are returnable readily to a definite and clear zero reading before the next measuring operation is begun.

8. **INCREASING AND DECREASING INDICATIONS.**—All fabric-measuring devices shall be accurate in their length and value indications whether the indications are being increased or decreased.

9. **LIMITATION OF USE.**—If a fabric-measuring device will not give accurate results when used for the measurement of all fabrics, then the device shall be so marked as clearly to indicate its limitations.

10. **LETTERING AND GRADUATIONS.**—All markings, instructions, figures, and graduations required under these specifications shall be of such size, design, material, and location and shall be so applied or affixed that they will not tend easily to become obliterated or illegible.

11. **FRAUDULENT CONSTRUCTION.**—All fabric-measuring devices and all devices designed to be attached thereto and used in connection therewith shall be of such design and construction that they do not facilitate the perpetration of fraud.

TOLERANCES

The tolerances to be allowed on the delivery ⁵ of fabric-measuring devices in excess (underregistration of device) and in deficiency (overregistration of device), to be applied on both increasing and decreasing registrations of the machine, shall be the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances on all new fabric-measuring devices shall be one-half of the values given.

Machine indication	Tolerances on delivery *	
	In deficiency (overregistration)	In excess (underregistration)
<i>Yards</i>	<i>Inch</i>	<i>Inches</i>
1 or less-----	1/4	3/8
2-----	1/4	3/8
3-----	5/16	3/8
4-----	5/16	1/2
5-----	3/8	5/8
6-----	3/8	3/4
7-----	1/2	1
8-----	1/2	1
9-----	5/8	1 1/4
10-----	3/4	1 1/2
11-----	3/4	1 1/2
12-----	7/8	1 3/4
13-----	7/8	1 3/4
14-----	1	2
15-----	1	2

* See footnote 5 below.

For machine indications of more than 15 yards add $\frac{1}{8}$ inch in deficiency and $\frac{1}{8}$ inch in excess per indicated yard.

⁵ "Tolerances on delivery" refers to the variations between the indications of the fabric-measuring device and the corresponding actual lengths of testing strip passed through the device, and does not apply to check measurements made upon lengths of fabrics which have been commercially measured.

TAXIMETERS

DEFINITIONS

A "taximeter" is a machine adapted automatically to calculate, at a predetermined rate or rates, and to register, the charge for hire of a vehicle.

The "fare" is that portion of the charge to be paid by the passenger for the hire of a vehicle, which is automatically calculated by the taximeter through the operation of the mileage mechanism, the time mechanism, or a combination of these.

The "extras" are those charges which are to be paid by the passenger in addition to the fare, and include any charge at a flat rate assessed for the transportation of passengers in excess of a stated minimum number as well as any charge for the transportation of baggage.

The "face" of a taximeter is that side upon which the charge to be paid by the passenger for the hire of a vehicle is indicated.

A "single-tariff" taximeter is one designed to calculate fares based on mileage at a single rate only.

A "multiple-tariff" taximeter is one so designed that it may be set to calculate fares based on mileage at any one of two or more rates.

A taximeter shall be considered to be "cleared" when it is inoperative with respect to all fare registration, when no figures indicating fare or extras are exposed to view, and when all of the parts are in that position in which they are designed to be when the vehicle to which the taximeter is or may be attached is not engaged by a passenger.

A "money drop" is an increment of fare registration. The "initial money drop" is the initial increment of fare registration following the flag pull.

The "flag" is the metal plate attached to the end of the lever arm by means of which the operating condition of the taximeter may be manually controlled.

SPECIFICATIONS

1. BASIS OF FARE CALCULATION.—Taximeters shall be so designed and constructed as to calculate the fare only upon one of the following bases:

(a) Mileage traveled.

(b) Time elapsed.

(c) A combination of mileage traveled and time elapsed such that when the taximeter is operable with respect to fare registration, the fare-registering mechanism is actuated by the mileage mechanism whenever the vehicle upon which the taximeter is installed is in motion at such a speed that the rate of mileage revenue per unit of time equals or exceeds the time rate, and may be actuated by the time mechanism, whenever the speed of the vehicle is less than this, or when the vehicle is stopped. When constructed upon this principle, provision shall be made whereby the driver of the vehicle may cause the clock mechanism to be operative or inoperative with respect to the fare-registering mechanism, as the occasion may demand.

2. CHARACTER OF INDICATIONS.—Taximeters shall be so designed and constructed that the following indications are shown upon the face:

(a) The condition of the taximeter, that is, whether it is inoperative or operative, and, if the latter, the character of fare registration for which it is set. This specification shall be construed to require (1) that while a taximeter is cleared, the indication "Not registering", "Vacant", or an equivalent expression shall appear; (2) that in the case of single-tariff taximeters, while the taximeter is in condition for fare registration on any basis, the indication "Registering", "Hired", or an equivalent expression shall appear; (3) that in the case of multiple-tariff taximeters, while in the condition described in (2) preceding, the basis for the particular tariff for which the taximeter is set shall be shown. In the case of the lowest rate for which the taximeter is adjusted the indication specified in (2) preceding shall be considered satisfactory; *in the case of any higher rate the indication shall be shown by such an expression as "3 or more persons," etc.*; and (4) that while the taximeter is so set that the clock mechanism is inoperative with respect to fare registration, the

indication "Time not recording" or an equivalent expression shall appear, except when the taximeter is cleared. This indication may replace the indication specified in (2) preceding, *but shall be in addition to the indication specified in (3) preceding for the higher rates on multiple-tariff taximeters.*

(b) The accumulated fare. The indications shall be identified by the word "Fare" or by an equivalent expression, and their values shall be defined by suitable words or monetary signs.

(c) The extras. Taximeters are not required to be constructed so as to register charges for extras, but when so constructed the following shall apply: Extras shall never be included in the fare registration, but shall always be indicated as a separate item. They shall be identified by the word "Extras" or by an equivalent expression, and their values shall be defined by suitable words or monetary signs.

The indications required by this specification shall be displayed through, and shall be entirely protected by, glass which shall be securely attached to the metal housing of the taximeter, so that the indications will be protected by the official seals.

NOTE.—Whenever charges for extras are prohibited by legal authority, or whenever the assessment of extras has been discontinued by a given taxicab operator, if the taximeters in use in the jurisdiction or by the operator in question are constructed to register extras, the extras mechanism on such taximeters shall be rendered inoperable or all indications on the faces of the taximeters of charges for extras shall be effectively obscured by permanent means.

3. OBSCURING OF INDICATIONS.—Except as provided by the "Note" of specification No. 2, and except when a taximeter is cleared, indications of the amount of fare and extras registered shall never be obscured, and the apertures through which such indications are read shall never be covered.

4. READABILITY OF INDICATIONS.—All apertures through which any indications or markings are viewed at any time shall be of such location, size, and design that the indications may be read with precision. This specification shall be construed to require that in the case of drums or dials designed to advance intermittently, but one indication shall be exposed to view at one time, and that in the case of graduated drums or dials designed to advance gradually

and continuously and to be read in combination with an indicator, a sufficient number of graduations and figures shall be exposed to view at all times readily to permit the indications to be read correctly.

5. STATEMENT OF RATES.—*All taximeters shall be marked upon their faces to show the rates, both for mileage and time, for which they are adjusted, and the schedule of extras when such charges are recognized. This specification shall be construed to require a statement of the mileage and time rates for the initial as well as for subsequent intervals whenever the rates are not uniform throughout. The words "Rate", "Rates", or "Rates of fare" shall precede the actual statement of the rates, and the latter shall be self-explanatory and readily understandable by the ordinary passenger.*

The marking required by this specification shall either be of a permanent character, or shall be displayed through, and shall be entirely protected by, glass securely attached to the metal housing of the taximeter, so that the marking will be protected by the official seals.

6. MARKING OF CHANGE GEARS.—*All individual change gears utilized in compensating for differences in tire diameters shall be plainly marked to show the number of their teeth.*

7. LETTERING AND GRADUATIONS.—*All indications and markings required under these specifications shall be of such size, design, material, and location and shall be so applied or affixed that they are definite and distinct and that they will not tend easily to become obliterated or illegible.*

8. FLAG.—*All taximeters shall be equipped with a flag. The positions of the flag, corresponding to the different conditions of a taximeter, shall be mechanically defined, and displacement from any one of these positions shall be sufficiently obstructed so that the accidental or inadvertent changing of the condition of the taximeter is improbable. The flag shall be at its highest position when the taximeter is cleared and in this position the whole of the flag shall be above the level of the taximeter housing. Adequate provision shall be made so that the attempted movement of the flag to an operating position immediately following its movement to the cleared position shall automatically be so delayed that the taximeter mechanism may come to complete rest in the cleared condition before such subsequent movement is begun.*

9. "EXTRAS" KNOB OR HANDLE.—The knob, handle, or other means utilized to actuate the "extras" mechanism shall be inoperative whenever the taximeter is in the cleared condition; that is, whenever it is not in a condition to register fares.

10. PROVISION FOR SEALING.—Adequate provision shall be made for sealing all taximeters, and in the case of complete assemblies—that is, installations upon cabs of taximeters and the various gears and other parts required for service operation—adequate provision shall be made for sealing all of the parts in place, in such manner that no adjustments, alterations, or replacements, affecting in any way the indications, the time or mileage rates, or, in general, the accuracy of the taximeters or the assemblies, can be made without mutilating or destroying the seal or seals.

11. PERMANENCE.—*Taximeters shall be of such design, construction, and materials that they may reasonably be expected to withstand ordinary usage without impairment of their accuracy or the correct functioning of their operating and indicating parts. This specification shall be construed to require that in the case of ratchets and pawls and similar combinations, wherever the accuracy or consistency of the indications of the taximeter would be affected by the wearing away or the deformation of one or both of the cooperating parts, the ratchets and pawls shall be fabricated of such material and shall be hardened to such a degree and extent that the wear or deformation resulting from use will be reduced to a minimum.*

12. FRAUDULENT CONSTRUCTION.—All taximeters and all mechanisms and devices designed to be attached thereto and used in connection therewith shall be of such design and construction and shall be so installed for use that they do not facilitate the perpetration of fraud.

TOLERANCES

DEFINITIONS.—A "bench test" is a test of a taximeter head alone, except that the gear box—that is, the change gears designed to compensate for tires of different sizes—may be attached.

A "wheel test" is a test of the entire taximeter assembly when mounted upon a vehicle, the mechanism being actuated by the mechanical revolution of the vehicle wheel while the cab remains at rest.

A "road test" is a test similar to a wheel test except that the mechanism is actuated as a result of cab travel.

The "initial" mileage or time interval is the mileage or time interval corresponding to the initial money drop.

"Tolerance in deficiency" and "tolerance in excess" are the allowable errors in the directions of overregistration and underregistration, respectively.

VALUES.—The tolerances to be allowed on all taximeters shall be as follows:

1. On Mileage Tests.—(a) On bench test.—With respect to the nominal number of spindle revolutions, no tolerance in deficiency and a tolerance in excess, of 2 percent of the interval under test, with an added tolerance of 100 feet whenever the initial interval is included in the interval under test.

(b) On wheel and road tests.—With respect to distance computed or actually traveled, no tolerance in deficiency and a tolerance in excess, of 4 percent of the interval under test, with an added tolerance of 100 feet whenever the initial interval is included in the interval under test: Provided, however, That on a road test if the vehicle tires are obviously worn, a tolerance in deficiency, of 1 percent shall be allowed.

NOTE.—In computing road results and calculating the values of change gears for the purpose of applying tolerances, the mean effective circumference of tire shall be used. This shall be determined upon a new tire of the size, kind, and make in use, inflated to the pressure recommended by the manufacturer, and mounted upon a vehicle, by causing the tire to describe several complete revolutions upon a smooth surface, finding the average distance advanced per revolution, and deducting from the result 1 percent.

2. On Time Tests.—(a) On individual time intervals.—A tolerance of 3 seconds per minute (5 percent) in deficiency and a tolerance of 6 seconds per minute (10 percent) in excess: Provided, however, That on the initial time interval the tolerance in excess shall be 9 seconds per minute (15 percent).

(b) On the average time interval (computed after excluding the initial interval).—No tolerance in deficiency and a tolerance of 3 seconds per minute (5 percent) in excess.

REGULATIONS

1. **VISIBILITY OF INDICATIONS.**—When mounted upon a cab a taximeter shall be so placed that its face is in plain view of a passenger seated upon the rear seat of the cab. Adequate lighting facilities shall be provided for so illuminating the face of the taximeter that the indications thereof may be conveniently read by the passenger and the face of the taximeter shall be so illuminated whenever the taximeter is in operation and artificial illumination is necessary for the convenient reading of its indications.

ODOMETERS

NOTES.—The following specifications and tolerances shall apply to odometers in those cases in which odometers are used or to be used commercially—that is, to determine charges for hire of a vehicle—and such use shall be permitted only when these specifications and tolerances are complied with. Whenever odometer readings form the basis for the payment of fees or taxes to or for the preparation of reports for governmental agencies, for the determination of insurance premiums, or in other such cases, and weights and measures officials undertake to inspect and test such odometers, what follows is recommended as the basis for such examinations; the requirements should be applied insofar as they are applicable and not modified by the conditions surrounding the special use.

It is strongly urged that compliance with the tolerances be determined by the performance of the complete assembly installed on the vehicle with which it is to be used, in a road test over a measured course. During such test the vehicle shall carry an average load and the tires shall be inflated to normal pressure recommended by the manufacturer of the tires.

It is recognized that physical limitations, such as very heavy traffic conditions in the vicinity of the place where the tests of odometers must be made, may in certain instances preclude the possibility of the road test recommended. Necessarily in such cases some other method of test must be resorted to. The only other method of test which is at all adequate is that known as the "wheel test", which is a test of the entire odometer assembly when mounted upon a vehicle, the mechanism being actuated by the mechanical revolution of the vehicle wheel while the car remains at rest. The corresponding vehicle travel can be computed when the rolling circumference of the tire on the wheel of the vehicle which actuates the odometer, under average load and with normal tire inflation, is accurately known, and this computed travel can be compared with the registration of the device. Specially constructed apparatus will be necessary if the test is to be made in this way.

The "bench test" is believed to be inadequate for odometer assemblies and is not recommended.

After approval of the complete assembly, suitable seals shall be applied so that no part of the odometer mechanism or of the connections leading thereto may be removed, or modified in such a way as to affect the accuracy of registration, without destroying or mutilating the seal or seals.

Whenever an odometer has been damaged, whenever repairs which might in any way affect the accuracy of its registration have been made, or whenever any of the official seals have been destroyed or mutilated, such odometer shall not thereafter be used commercially

until inspected and, if deemed necessary, tested by the weights and measures official.

DEFINITION

An odometer is a mechanism or machine designed to be attached permanently to a vehicle and adapted automatically to register the distance traversed by the vehicle. For the purpose of these specifications and tolerances, this definition shall be construed to include hub odometers, cable-driven odometers, and the mileage-recording, or odometer, portions of the so-called "speedometer" assemblies for automobiles.

SPECIFICATIONS

1. CHARACTER OF INDICATION.—Odometers shall be so designed and constructed that they will register in terms of miles *and tenth-miles*.

2. MOVEMENT OF INDICATORS.—All odometers shall be so designed and constructed that when installed on a vehicle the registration of the odometer shall be susceptible of increase only by the rotation of the vehicle wheel or wheels. The tenth-mile indicator may advance continuously or intermittently; other indicators shall advance intermittently. In all cases in which indicators advance intermittently, movement shall be communicated to the indicator drum or dial only during that period in which the advance of the mechanism corresponding to not more than the 0.1 mile immediately preceding the next higher indication, is taking place. An odometer may be provided with means for reducing the registration to zero.

3. READABILITY OF INDICATIONS.—Mileage figures and the apertures through which they are viewed shall be of such size, design, and location that the indications of the odometer may be easily and accurately read. The figures and their backgrounds shall be of sharply contrasting colors; the color of all figures except those indicating tenth-miles shall be uniform, and the color of the tenth-mile figures shall be different from the color of the other figures. Except during the period of advance of an indicator to the next higher indication, only one figure on each drum or dial shall be exposed to view. Any protective covering intended to be

transparent shall be in such condition that it can be made transparent by ordinary cleaning of its exposed surface.

4. VISIBILITY OF REGISTRATION.—Whenever an odometer is utilized upon a vehicle in lieu of and for the purposes for which a taximeter is commonly employed in regular taxicab service, the odometer shall be so positioned on the vehicle that the registration of the device is in full view from the interior of the vehicle; in all other cases the odometer shall be so positioned that it is readily accessible for the reading of its registration.

5. PROVISION FOR SEALING.—Adequate provision shall be made for sealing in place all complete odometer assemblies—that is, installations upon vehicles of odometers and the various gears and other parts required for service operation—in such a manner that no adjustments, replacements of or to any parts of such assemblies, or alterations, which might affect in any way the accuracy of the odometer registration, can be made without destroying or mutilating the seal or seals.

The seal or seals required by the provision of this specification shall be so applied that they are visible; that is, it shall not be necessary to disassemble or remove any part of the vehicle or odometer to determine whether such seals are intact.

6. PERMANENCE.—Odometers shall be of such design, construction, and materials that they may reasonably be expected to withstand ordinary usage without impairment of their accuracy or the correct functioning of their operating and indicating parts. This specification shall be construed to require that in the case of ratchets and pawls and similar combinations, wherever the accuracy or consistency of the indications of the odometer would be affected by the wearing away or the deformation of one or both of the cooperating parts, the ratchets and pawls shall be fabricated of such material and shall be hardened to such a degree and extent that the wear or deformation resulting from use will be reduced to a minimum.

7. FRAUDULENT CONSTRUCTION.—All odometers and all mechanisms and devices designed to be attached thereto and used in connection therewith shall be of such design and construction and shall be so installed for use that they do not facilitate the perpetration of fraud.

TOLERANCES

The tolerances to be allowed on the registration of odometers with respect to distance actually traversed or computed shall be as follows:

Tolerance in deficiency (overregistration): None, except when the vehicle tires are seriously worn, in which case 1 percent of the interval under test shall be allowed.

Tolerance in excess (underregistration): Four percent of the interval under test.

LIQUID CAPACITY MEASURES

SPECIFICATIONS

1. Liquid measures shall be made of metal, glass, earthenware, enameled ware, composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming bent, indented, distorted, or otherwise damaged: *Provided, however, That when the measure is made of iron or steel, or iron or steel plated with tin, zinc, or copper, or is made of copper, the minimum thicknesses of the metal shall be those given in the following table:*

<i>Capacity of measure</i>	<i>Minimum thickness if of iron or steel or of plated iron or steel ^a</i>	<i>Minimum thickness if of copper</i>
	<i>Inch</i>	<i>Inch</i>
<i>Over 1 gallon.....</i>	<i>0. 016</i>	<i>0. 032</i>
<i>1 gallon.....</i>	<i>. 014</i>	<i>. 028</i>
<i>1/2 gallon.....</i>	<i>. 014</i>	<i>. 028</i>
<i>1 quart.....</i>	<i>. 014</i>	<i>. 028</i>
<i>1 pint or less.....</i>	<i>. 010</i>	<i>. 020</i>

^a The following commercial tin plates will comply with these requirements: Over 1 gallon, 2XL; 1 gallon, 1/2 gallon, and 1 quart, IX; 1 pint or less, ICL.

2. Liquid measures of the customary system shall be of one of the following capacities only: One gallon, a multiple of the gallon, or a binary submultiple of the gallon, that is, a measure obtained by dividing the gallon by the number 2 or by a power of the number 2: *Provided, however, That*

nothing in this specification shall be construed to prevent the use of cans for ice cream, exclusively, in the 2½-gallon (10-quart) size, but only when having an inside diameter of not less than 8½ inches, or of brick molds for ice cream, exclusively, in 5-pint and 3-pint sizes.

3. Liquid measures shall be so constructed that the capacity is determined by a definite edge, plate, bar, or wire at or near the top of the measure. When one of the last three forms is employed the capacity shall be determined to the lowest portion of such plate, bar, or wire.

4. No subdivided liquid measures shall be allowed, and the only reinforcing rings which may be used are those which are firmly attached to the outside of the measure and do not, by indentations or in any other manner, show divisions or lines on the inside surface of the measure.

5. *The capacity of the measure shall be conspicuously, legibly, and permanently indicated on the side of the measure. This shall be in combination with the word "Liquid" or the letters "Liq" in the case of measures in which the word "quart" or "pint" occurs. In the case of measures made of earthenware, enameled ware, or composition, this marking shall be of a different color than the measure.*

6. If a liquid measure is provided with a tap or spigot, the construction shall be such that the measure may be completely emptied by the tap or spigot while it is standing upon a level surface.

7. When a lip or rim, designed both to facilitate pouring and to receive any overflow, is provided, the measure shall be so constructed as to hold its full capacity exclusive of the lip or rim, while it is standing upon a level surface.

TOLERANCES

The tolerances to be allowed in excess and in deficiency on all liquid capacity measures shall be the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new liquid capacity measures shall be one-half of the values given.

Capacity of measure	Tolerance			
	In excess		In deficiency	
	<i>Liquid ounces</i>	<i>Cubic inches</i>	<i>Liquid ounces</i>	<i>Cubic inches</i>
10 gallons-----	10	18. 0	5. 0	9. 0
5 gallons-----	6	11. 0	3. 0	5. 4
4 gallons-----	4	7. 0	2. 0	3. 6
3 gallons-----	4	7. 0	2. 0	3. 6
2 gallons-----	2	3. 5	1. 0	1. 8
			<i>Liquid drams</i>	
1 gallon-----	1	1. 8	4. 0	. 9
	<i>Liquid drams</i>			
1/2 gallon-----	6	1. 4	3. 0	. 7
1 quart-----	4	. 9	2. 0	. 5
1 pint-----	3	. 7	1. 5	. 3
1/2 pint-----	2	. 4	1. 0	. 2
1 gill-----	2	. 4	1. 0	. 2

GLASS GRADUATES

SPECIFICATIONS

1. Graduates shall be made to contain or to deliver the indicated volume at 20°C (68°F). They shall be legibly, conspicuously, and permanently marked to indicate whether they are graduated to contain or to deliver.

2. Graduates shall be either cylindrical or conical in shape. In the case of all cylindrical graduates the ratio of length of the graduated scale to the internal diameter shall not be less than five to one. In the case of conical graduates the ratio of length of the graduated scale to the internal diameter at the highest graduation shall be not less than two to one, and at one-fourth of the total capacity this ratio shall be not less than one to one.

3. Graduates shall be made of good quality glass, thoroughly annealed, clear, transparent, of uniform but not excessive thickness, and free from bubbles and streaks.

4. Graduates shall be provided with a base at right angles to the axis and of such a diameter that the graduate will stand when placed on a surface making an angle of 25 percent, or approximately 15° , with the horizontal.

5. All graduates shall be provided with pouring lips.

6. The graduation marks shall be perpendicular to the axis and parallel to the base and to each other.

7. Main graduation marks are those indicating the principal subdivisions into which a graduate is divided, the value of which should readily be ascertainable in order to facilitate the reading of the graduate at any point on its scale. All main graduation marks shall extend around the same proportional part of the circumference of the graduate. All graduation marks of this character shall be construed to be main graduation marks. These graduations shall extend at

least one-half of the distance around the graduate: Provided, however, That on duplex, or double-scale, graduates a clear space shall be left between the ends of the main graduation marks on the two scales, and this space, measured parallel to the graduation marks, shall conform to the following values:

Circumference of graduate at the graduation marks	Distance between ends of graduation marks
Up to 5 inches----- From 5 inches to 10 inches, inclusive----- More than 10 inches-----	Inch 1/8 to 1/4 1/4 to 1/2 3/8 to 5/8

Intermediate graduation marks are those which extend around a smaller proportional part of the circumference of the graduate than do the main graduation marks, and when these are employed the graduations shall be varied in length in such a manner that the scale may be conveniently read, *but in no case shall any graduation mark extend less than one-fourth of the distance around the graduate.*

8. Graduation marks shall be clear and distinct and uniform in character. They shall be etched or engraved, and shall not exceed 0.015 inch (0.38 mm) in width. Blown or pressed graduation marks shall not be allowed.

9. *The clear interval between the graduation marks shall not be less than 0.04 inch (1 mm).*

10. The value of the main graduation marks shall be plainly designated, *each number being placed either directly upon or immediately above the graduation mark to which it refers*, but the position of the numbers shall be consistent throughout the graduated scale. *If placed upon the graduation marks, the numbers shall be placed from the ends a sufficient distance to allow the ends to be used in making a setting. Intermediate graduation marks shall not be numbered.*

11. *On all single-scale graduates, where the main graduation marks do not completely encircle the graduate, the middle points of the main graduation marks shall be directly opposite the lip. On duplex, or double-scale, graduates the center of the clear spaces between the ends of the main graduation marks, provided for in specification 7, shall be approximately 90° from the lip.*

TOLERANCES

The tolerances to be allowed in excess or deficiency on glass graduates marked "to contain" shall be the values shown in the following tables; the tolerances to be allowed on graduates marked "to deliver" shall be 25 percent greater than the values given.

NOTE.—The tolerance to be used at any point on any graduate shall be determined by measuring the inside diameter of the graduate at the point under test and taking from the table the tolerance value corresponding to this diameter.

Tolerance for Graduates of Various Diameters

[Values Expressed in U. S. Customary Units]

Diameter				Diameter			
		Tolerance				Tolerance	
<i>Inches</i>	<i>Six- teenths</i>	<i>Liquid drams</i>	<i>Minims</i>	<i>Inches</i>	<i>Six- teenths</i>	<i>Liquid drams</i>	<i>Minims</i>
--	6	--	0.6	2	4	--	32
--	7	--	.8	2	5	--	34
--	8	--	1.0	2	6	--	36
--	9	--	1.3	2	7	--	39
--	10	--	1.6	2	8	--	41
--	11	--	2.0				
--	12	--	2.5	2	9	--	44
--	13	--	3.0	2	10	--	47
--	14	--	3.5	2	11	--	49
--	15	--	4.0	2	12	--	52
				2	13	--	55
1	0	--	5				
1	1	--	6	2	14	--	58
1	2	--	6	2	15	1	2
1	3	--	7	3	0	1	5
1	4	--	8	3	1	1	8
				3	2	1	12
1	5	--	9				
1	6	--	10	3	3	1	15
1	7	--	11	3	4	1	18
1	8	--	12	3	5	1	21
1	9	--	14	3	6	1	24
				3	7	1	27
1	10	--	15				
1	11	--	16	3	8	1	31
1	12	--	17	3	9	1	34
1	13	--	19	3	10	1	38
1	14	--	21	3	11	1	41
				3	12	1	44
1	15	--	22				
2	0	--	24	3	13	1	47
2	1	--	26	3	14	1	51
2	2	--	28	3	15	1	55
2	3	--	30	4	0	2	0

Tolerance for Graduates of Various Diameters

[Values Expressed in Metric Units]

Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance
<i>Millimeters</i>	<i>Millili- ters ^a</i>	<i>Millimeters</i>	<i>Millili- ters ^a</i>	<i>Millimeters</i>	<i>Millili- ters ^a</i>
10-----	0.04	40-----	0.85	70-----	3.2
11-----	.05	41-----	.90	71-----	3.4
12-----	.06	42-----	.95	72-----	3.5
13-----	.07	43-----	1.00	73-----	3.6
14-----	.08	44-----	1.05	74-----	3.7
15-----	.09	45-----	1.10	75-----	3.9
16-----	.10	46-----	1.15	76-----	4.0
17-----	.12	47-----	1.25	77-----	4.1
18-----	.14	48-----	1.30	78-----	4.2
19-----	.16	49-----	1.35	79-----	4.4
20-----	.18	50-----	1.4	80-----	4.5
21-----	.20	51-----	1.5	81-----	4.6
22-----	.22	52-----	1.6	82-----	4.8
23-----	.24	53-----	1.6	83-----	4.9
24-----	.26	54-----	1.7	84-----	5.0
25-----	.28	55-----	1.8	85-----	5.1
26-----	.30	56-----	1.9	86-----	5.2
27-----	.35	57-----	2.0	87-----	5.4
28-----	.35	58-----	2.0	88-----	5.5
29-----	.40	59-----	2.1	89-----	5.6
30-----	.45	60-----	2.2	90-----	5.7
31-----	.45	61-----	2.3	91-----	5.9
32-----	.50	62-----	2.4	92-----	6.0
33-----	.55	63-----	2.5	93-----	6.1
34-----	.60	64-----	2.6	94-----	6.2
35-----	.60	65-----	2.7	95-----	6.4
36-----	.65	66-----	2.8	96-----	6.5
37-----	.70	67-----	2.9	97-----	6.6
38-----	.75	68-----	3.0	98-----	6.8
39-----	.80	69-----	3.1	99-----	6.9
				100-----	7.1

^a The term milliliter, or "ml," is used herein to designate the one-thousandth part of the liter. This unit is also commonly known as the cubic centimeter, or the "cc." The latter is not an accurate usage, as the units are not exactly equal, but the difference between them is of no consequence for the purposes of this table, and therefore they may be used interchangeably.

Name	Age	Sex	Rank	Class	Year	Grade	Score	Remarks
John A. Smith	21	M	1st	A	1888	1st	95	Excellent
Mary E. Jones	19	F	2nd	B	1888	2nd	88	Good
James H. Brown	22	M	3rd	C	1888	3rd	82	Fair
Elizabeth C. White	18	F	4th	D	1888	4th	75	Average
Robert L. Green	20	M	5th	E	1888	5th	70	Below Average
Sarah M. Black	17	F	6th	F	1888	6th	65	Poor
William D. Gray	23	M	7th	G	1888	7th	60	Very Poor
Anna K. Hall	16	F	8th	H	1888	8th	55	Failing
Thomas R. Young	24	M	9th	I	1888	9th	50	Failing
Margaret A. Scott	15	F	10th	J	1888	10th	45	Failing

SINGLE-SERVICE MEASURE-CONTAINERS (EXCEPT MILK BOTTLES)

NOTES.—The following specifications and tolerances are not to be construed to apply to measure-containers used for milk, cream, and buttermilk, these being covered by the code for Milk Bottles.

The following specifications and tolerances shall not become effective prior to July 1, 1942.

DEFINITION

A single-service measure-container, hereinafter referred to as a measure-container, is a container intended to be used once only, to determine at the time of sale the quantity of commodity comprising a retail sale made on the basis of liquid measure and to serve as the container for the delivery of the commodity to the customer.

SPECIFICATIONS

1. CAPACITY.—Measure-containers shall not be subdivided and shall be of one of the following capacities only: 1 gallon, $\frac{1}{2}$ gallon, 1 quart, 1 pint, $\frac{1}{2}$ pint, and 1 gill standard liquid measure.

2. PROPORTIONS.—The over-all inside height of a measure-container shall not be more than twice (a) the mean inside diameter (if conical or cylindrical) or (b) the length of the short side of a mid-section (if of rectangular cross section).

3. FILLING POINT.—The capacity of a measure-container shall be determined to a definite filling point, which shall be (a) the top edge, (b) a graduation near the top edge, or (c) the lowest portion of a shoulder, cap seat, lid seat, or indentation near the top edge, of the measure-container. The filling point shall be sharply defined and it shall extend at least halfway around the circumference or across two opposite sides.

4. MARKING.—A measure-container shall have its capacity conspicuously marked on the side in combination with the word "Liquid" or the letters "Liq" when the word "Quart" or "Pint" occurs. If the filling point is below the top edge, there shall be on the side of the measure-container a conspicuous and suitable statement clearly identifying the filling point provided. On the side or bottom of the measure-container shall appear the name, initials, or trade mark of the manufacturer. All required marking shall be clear and legible.

TOLERANCES

The tolerances to be allowed in excess or deficiency on measure-containers shall be the values shown in the following table:

Capacity	Tolerance		Capacity	Tolerance	
	<i>Liquid drams</i>	<i>Cubic inches</i>		<i>Liquid drams</i>	<i>Cubic inches</i>
1 gallon-----	6	1.4	1 pint-----	2	0.5
1/2 gallon-----	4.5	1.0	1/2 pint-----	1.5	.3
1 quart-----	3	.7	1 gill-----	1.5	.3

MILK BOTTLES

DEFINITION

Milk bottles shall be construed to include all glass bottles of the form which has been customarily used for the purpose of the measurement and delivery of milk, cream, and butter-milk, at retail, and also other containers which are employed for this purpose.

SPECIFICATIONS

1. Milk bottles shall be made only in sizes heretofore specified under the heading "Liquid Capacity Measures," and they shall be made to contain their indicated capacities at a temperature of 20° C (68° F).

2. *Each milk bottle shall have its capacity clearly blown or otherwise clearly and permanently marked in or on the side of the bottle, and in or on the side or bottom the name, initials, or trade-mark of the manufacturer thereof.*

3. Milk bottles with an inside diameter of not over 2 inches immediately below the plane of the sealing surface shall hold the correct capacity when filled to a point $\frac{1}{4}$ inch below the plane of the sealing surface; bottles with an inside diameter of more than 2 inches shall hold the correct capacity when filled to a point $\frac{1}{8}$ inch below such plane: Provided, however, That a larger distance shall be allowed below the plane of the sealing surface when the bottles are provided with a clearly defined line blown or otherwise clearly and permanently marked in or on the bottle, and extending at least halfway around it, which indicates the correct capacity, and directly over, below, or beside this line, with the words "Fill to line" or a similar and suitable inscription clearly and permanently marked in or on the bottle. The distance between the line herein mentioned and the plane of the

sealing surface shall in no case exceed that given in the table below.

Capacity of bottle	Maximum distance allowable
	<i>Inches</i>
2 quarts-----	2
1 quart-----	1 1/2
1 pint-----	1
1/2 pint-----	5/8
1 gill-----	5/8

4. When a milk bottle is designed for optional, or "multiple", types of bottle closure, the plane of the lowest sealing surface shall govern for purposes of the application of specification requirements and tolerances except when there is a clearly defined filling line below the plane of the lowest sealing surface, in which case such filling line shall so govern.

TOLERANCES

The tolerances to be allowed in excess and in deficiency on milk bottles shall be as follows:

1. When a test comprises less than 25 bottles of the same capacity and ownership, the tolerances shall be those given in table A below.

2. When a test comprises 25 or more bottles of the same capacity and ownership, the tolerances shall be applied not only to the individual bottles but also to the average capacity of at least 25 such bottles, these to be taken at random when the whole supply available is not tested. The error on any individual bottle among those tested shall not exceed the values shown in table A below. The average error on the bottles tested shall not exceed the values shown in table B below: Provided, however, That in the case of bottles already in use, if the average error is greater than that above specified, then, if desired, all of the bottles of the particular size and ownership in question may be treated as individual

measures, in which case all of these bottles shall be separately tested, and the tolerances shown in table C below shall be applied.

NOTE.—To find the average error on a number of bottles, first add all those errors which are in excess; then add all those errors which are in deficiency; then subtract the smaller sum from the larger; and finally divide this result by the total number of bottles tested.

Capacity	Table A, tolerance on individual bottle		Table B, tolerance on average capacity		Table C, special tolerance for individual bottles al- ready in use			
					In excess		In deficiency	
	<i>Liquid drams</i>	<i>Cubic inches</i>	<i>Liquid drams</i>	<i>Cubic inches</i>	<i>Liquid drams</i>	<i>Cubic inches</i>	<i>Liquid drams</i>	<i>Cubic inches</i>
2 gallons---	18	4.1	4.5	1.0	18	4.1	9	2.0
1 gallon---	10	2.3	2.5	.6	10	2.3	5	1.2
2 quarts---	6	1.4	1.5	.35	6	1.4	3	.7
1 quart---	4	.9	1.0	.23	4	.9	2	.5
1 pint-----	3	.7	.75	.17	3	.7	1.5	.3
1/2 pint----	2	.5	.5	.12	2	.5	1.0	.2
1 gill-----	2	.5	.5	.12	2	.5	1.0	.2

LUBRICATING-OIL BOTTLES

DEFINITION

Lubricating-oil bottles shall be construed to include all bottles used for the sale of lubricating oils for immediate delivery to the crankcase of a motor vehicle, whether or not the bottle is used to determine the quantity of oil sold and whether or not it is sealed with a cap or some other device.

SPECIFICATIONS

1. Lubricating-oil bottles shall be made of clear, uncolored glass and only in sizes heretofore specified under the heading "Liquid Capacity Measures." They shall be made to contain their indicated capacities at a temperature of 20° C (68° F), and they shall not be subdivided.

2. A lubricating-oil bottle shall be marked on the side with its capacity and on the side or bottom with the name, initials, or trade-mark of the manufacturer.

3. A lubricating-oil bottle shall be provided with a clearly defined graduation line indicating its capacity, and with the words "Fill to line", "One quart to line", or a similar and suitable inscription, clearly referring to this capacity line. The capacity line shall occupy at least one-half of the circumference of the bottle, and shall not be more than 0.10 inch in width. This specification shall not be construed to prohibit the placing of an auxiliary line above the capacity line, to serve as a guide for filling with an excess measure of oil, but in case such auxiliary line is provided it shall be undesignated and shall be less prominent than the capacity line so that it will not be confused therewith.

4. A lubricating-oil bottle shall be so designed and constructed that the capacity of that portion of it above the capacity line is at least 3 cubic inches, and that there shall be at least $\frac{1}{4}$ inch clear space between the capacity line and any metal or other opaque top or spout when such top or spout is screwed firmly into place or otherwise securely attached.

5. A lubricating-oil bottle shall be accurate within the tolerance provided when filled so that the top of the meniscus of the water which is used in the test of the bottle coincides with the bottom of the capacity line.

6. A lubricating-oil bottle shall be so designed and constructed that free and unobstructed drainage is provided.

7. All markings or graduations required by the provisions of these specifications shall be blown or otherwise permanently marked in or on the lubricating-oil bottle, and shall be clear and distinct.

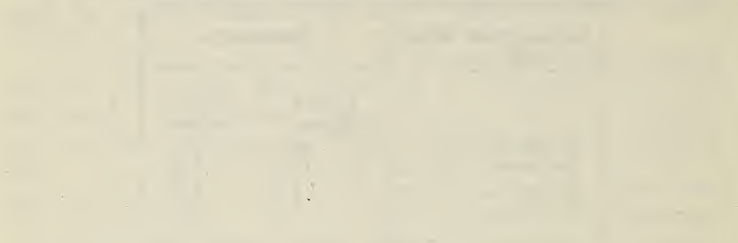
TOLERANCES

The tolerances to be allowed on lubricating-oil bottles shall be in excess only and shall be the values shown in the following table. There shall be no tolerance allowed in deficiency.

Capacity of bottle	Tolerance	
	<i>Liquid drams</i>	<i>Cubic inches</i>
1 gallon.....	20	4.5
2 quarts.....	12	2.7
1 quart.....	8	1.8
1 pint.....	6	1.4

The following is a list of the various types of bottles used for lubricating oils, and the reasons for their use. The first type is the standard bottle, which is used for all grades of oil. The second type is the special bottle, which is used for special grades of oil. The third type is the special bottle, which is used for special grades of oil. The fourth type is the special bottle, which is used for special grades of oil. The fifth type is the special bottle, which is used for special grades of oil. The sixth type is the special bottle, which is used for special grades of oil. The seventh type is the special bottle, which is used for special grades of oil. The eighth type is the special bottle, which is used for special grades of oil. The ninth type is the special bottle, which is used for special grades of oil. The tenth type is the special bottle, which is used for special grades of oil.

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LIQUID-MEASURING DEVICES

NOTE.—The following specifications, tolerances, and regulations are not to be construed to apply to grease-measuring devices or to water meters.

DEFINITIONS

A mechanically operated liquid-measuring device, hereinafter referred to as a "liquid-measuring device", is a mechanism or machine adapted to measure and deliver liquid by volume.

A liquid-measuring device of the retail type, hereinafter referred to as a "retail device," is a liquid-measuring device which, on account of its design and the character of its primary indicating elements, is obviously intended for retail deliveries to individual consumers.

A liquid-measuring device of the wholesale type, hereinafter referred to as a "wholesale device", is a liquid-measuring device which, on account of the character of its primary indicating elements, is obviously designed for single deliveries of 100 gallons or more.

SPECIFICATIONS APPLICABLE BOTH TO RETAIL AND TO WHOLESALE DEVICES

1. PERMANENCE.—*All liquid-measuring devices shall be of such design, construction, and materials that they may reasonably be expected to withstand ordinary usage without impairment of the accuracy of their measurement or the correct functioning of their operating or indicating parts.*

2. PLUMB AND LEVEL CONDITIONS.—*All liquid-measuring devices shall be so designed and constructed that they will be in normal operating position when they are in level.*

3. MEANS TO DETERMINE LEVEL.—*Liquid-measuring devices, the indications or deliveries of which are changed by an amount greater than one-half the tolerances allowed, when set in any position on a surface making an angle of 5 percent or approximately 3° with the horizontal, shall be equipped with*

suitable means by which the level can be determined and established, such as a two-way or a circular level, a plumb bob, leveling lugs, etc.

4. UNITS OF DELIVERY.—*Liquid-measuring devices shall have the following discharge capacities per stroke or per cycle of the primary indicating elements, and these only: 1 gallon, a multiple of the gallon, $2\frac{1}{2}$ gallons, or a binary submultiple of the gallon, that is, the quantity obtained by dividing the gallon by the number 2 or a power of the number 2: Provided, however, That a device may be constructed to deliver other amounts than the above, corresponding to predetermined money values at a definite price per gallon, but in such cases the device shall be so constructed that the price per gallon at which it is set at any time will be clearly indicated to the customer by automatic means. Fractional parts of a gallon may be indicated in terms of decimal or binary-submultiple subdivisions. In the case of a wholesale device, the value of the smallest unit of indicated delivery shall not exceed 1 gallon.*

5. PREVENTION OF REGISTRATION OF AIR.—*In any installation of a meter-type liquid-measuring device, adequate means shall be provided for preventing the passage of air or vapor through the meter. When gravity discharge is employed, if a mechanical air eliminator or other means to prevent inaccuracies of measure due to air or vapor in the liquid be not provided, provision shall be made for preventing a vortex at the point of discharge from the supply tank whereby air might be drawn into the line leading to the meter, and the meter shall be so mounted and the piping so arranged that the meter will not be drained of liquid during normal operation and that air will not be trapped in the meter inlet when the supply tank is filled. In a pump-discharge unit a mechanical air eliminator or other means shall be provided in such a position that it will effectively prevent the passage of air or vapor through the meter.*

The air eliminator or other means shall be considered effective if the provisions of specification No. 6 are complied with.

6. CONSTANCY OF DELIVERY.—*The amounts delivered by any liquid-measuring device shall not vary from the standard by more than the tolerances hereinafter provided (1) irrespective of whether the discharge of liquid is continuous or intermittent, (2) irrespective of the speed at which the device is operated, except that when operated considerably faster or slower than normal speed of operation the tolerance*

shall be applied in deficiency only—that is, the device shall not be deemed to be incorrect by reason of the tolerance in excess being exceeded during such unusual methods of operation—and (3) irrespective of the time elapsing between operations, subject to the conditions of the special elapsed-time test described below.

A special elapsed-time test shall be made to determine whether the device is satisfactory with respect to condition (3) above. In order to comply with this test, the condition of the device shall be such that the error due solely to the nonuse of the device does not exceed 2 cubic inches per hour in the case of a retail device and 5 cubic inches per hour in the case of a wholesale device: Provided, however, That in the case of a new device the permissible errors shall be one-half the values given above.

“Normal speed of operation” shall be construed to mean that range of operating speeds which may reasonably be employed in ordinary commercial usage; in the case of meters used for the purpose of determining the quantity of liquid delivered to an individual purchaser, this shall mean operation within the limits of the discharge rates ordinarily developed under conditions of installation recommended or specified by the manufacturer for the particular type of meter under test, *and all such meters shall be legibly marked to show the maximum discharge rates under normal conditions of installation and the minimum discharge rates and the maximum working pressures for which they are intended to be used: Provided, however, That in lieu of the maximum rate the words “full flow”, or similar and suitable words may be used: And provided further, That in the case of retail devices the value of the minimum rate shall not exceed 7 gallons per minute, and in the case of wholesale devices not exceeding 2½ inches in size, the value of the minimum rate shall not exceed 20 gallons per minute. On meters larger than 2½ inches in size the value of the minimum rate should be governed by the character of use of the meter.*

NOTES.—In the special elapsed-time test described above, allowance shall be made for errors due solely to a change in volume of the contained liquid, resulting from temperature variations alone, since an error of this character is unavoidable in the case of volumetric measurements of this kind when the apparatus is standing unused. This

change in volume due to temperature variations is, however, small in amount for all ordinary variations of temperature, amounting in the case of gasoline to about 0.6 percent for each 10° F change of temperature, or about 1.1 percent for each 10° C change of temperature.

In applying the elapsed-time test outlined above it is recommended that the delivery be not made through a hose, since the amount of gasoline necessary to wet the inside of the hose will cause an additional shortage in the delivery.

All meters encountered in the field should be tested at the maximum discharge rate developed under the conditions of installation actually employed regardless of whether this rate exceeds or is less than the maximum discharge rate marked on the meter, and also either at the rate of 7 gallons per minute, for retail devices, or at the rate of 20 gallons per minute, for wholesale devices not exceeding $2\frac{1}{2}$ inches in size, or at any lower discharge rate marked by the manufacturer.

7. INDICATING AND REGISTERING PARTS.—Counters, graduated scales and dials, and reading faces, used on liquid-measuring devices to tally sales and deliveries to individual purchasers or to indicate the amount delivered when any portion of the cycle or stroke has been completed, or the unit price or the total price thereof, shall be of such size and style and shall be so located and disposed that they are clearly visible to and readable by the customer from any position which he may reasonably be expected to assume; *in the case of a retail device this position shall be construed to mean any position within a field of 120° , defined by two vertical planes each at an angle of 30° with the counter, graduated scale or dial, or reading face, and passing through the center thereof.* The graduations shall be of such character and arrangement that the major ones are more prominent than and are clearly distinguishable from the minor ones. *In all types of liquid-measuring devices which have a graduated scale which at some point or points or at all points constitutes the sole or most sensitive means of determining the amount of liquid discharged, the width of the graduation marks shall not exceed 0.04 inch.*

8. MEANS FOR DISPLAY OF PROPER UNIT PRICE.—*A liquid-measuring device in which is incorporated a computing mechanism which indicates the total price of the amount of commodity delivered, for one of a series of unit prices, shall also be equipped with a unit-price mechanism by means of which the unit price at which the total price is being computed at any time shall be displayed on each face of the device.*

9. POINTERS AND INDICATORS.—All pointers and indicators which when used in conjunction with a graduated scale or dial indicate the amount of liquid discharged or the money value of the delivery at a predetermined price per unit of volume, shall be so shaped that a correct and accurate reading is given.

Pointers and indicators are required to be symmetrical about the graduation lines at which they may stand: Provided, however, That in the case of pointers and indicators used in connection with straight scales having nonparallel graduation lines and in respect to the nonhorizontal lines on such scales, this requirement shall be waived if the pointers and indicators are so designed and constructed that as the pointer or indicator approaches the correct indicating position in respect to any graduation line, only such portion of such graduation line as has not yet been reached by the index of the pointer or indicator or by a horizontal line extended forward from the end thereof, shall be exposed to view, and all other portions of such graduation line adjacent to the index of the pointer or indicator shall be automatically obscured.

Pointers and indicators which when used in conjunction with a graduated scale or dial constitute at some point or points or at all points the sole or most sensitive means of determining the amount of liquid discharged or the money value of the delivery at a predetermined price per unit of volume, shall reach to the finest graduation marks, and the width of the pointer or indicator, or of the end thereof, shall not be greater than the width of such marks; or if the construction is such that the indicator and the graduations are in the same plane, then there shall not be a separation of the ends of the graduations and the end of the indicator of more than 0.04 inch, this distance to be measured along the line of the graduations.

10. PARALLAX.—All liquid-measuring devices in which the accuracy of the readings of any indicating mechanism is affected by parallax shall be so designed and constructed as to reduce to a minimum the errors due to this cause.

This specification shall be construed to require that in the case of all devices which are equipped with a glass measuring chamber and in which the quantities delivered are determined by bringing the liquid surface into coincidence with indicators, pointers, or graduations, which at some point or points or at

all points constitute the sole or most sensitive means of determining the amount of liquid discharged, such pointers, indicators, or graduations shall be located inside the glass measuring chamber and not more than $\frac{1}{16}$ inch from the surface thereof.

11. GRADUATED SCALES.—When a liquid-measuring device is provided with a graduated scale or dial which is intended to be stationary in the normal use of the device, this shall be riveted to its supports or otherwise permanently fixed in position: Provided, however, That in the case of liquid-measuring devices of the gage-glass type a sliding scale will be permitted when the displacement of such scale is, by suitable means, automatically prevented at all times when liquid is being discharged from the delivery outlet.

12. NUMBERING OF GRADUATIONS.—*Figures defining the value of graduations shall be uniformly placed in reference to the graduation marks and shall be as close thereto as practicable but shall not be so placed as to interfere with the accuracy of reading. Such figures shall be in regular sequence; that is, sequences such as 5, 1, 2, 3, 4, shall not be permitted.*

13. SCALES READING IN OPPOSITE DIRECTIONS.—The use on a liquid-measuring device of two graduated scales reading in opposite directions and referable to the same indicating means shall not be permitted.

14. LETTERING AND GRADUATIONS.—*All markings, instructions, figures, and graduations required under these specifications shall be of such size, design, material, and location, and shall be so applied or affixed, that they will not tend easily to become obliterated or illegible.*

15. POSITIVE STOPS.—*When the stops or other stroke-limiting devices on a liquid-measuring device are subject to direct pressure or impact in the operation of the device, such stops shall be of such construction that the permanence and security of their positions is provided for by a positive, non-frictional engagement of the parts whose relative motions are to be prevented. Such stops shall be so designed and constructed that adjustment within the prescribed tolerances can be made.*

16. POSITIONING OF STOP MECHANISM.—All liquid-measuring devices designed to deliver two or more different predetermined amounts by bringing into operation different stops or other means of defining the delivery, shall be so designed and constructed that the position for the proper

setting of each stop is definitely and accurately defined, inadvertent displacement from this position is obstructed, and the delivery for which the device is set at any time is clearly and conspicuously indicated.

17. PROVISION FOR SEALING.—*All devices adapted to be altered for adjusting or correcting the delivery of a liquid-measuring device, or for changing the maximum delivery rate of a meter when this change tends to affect the accuracy of the deliveries, shall be of such construction that they can be sealed, either separately or together, in such a manner that the position of none of them can be changed without destroying the seal or seals: Provided, however, That this shall not apply to such devices as alter the deliveries to conform to different prices per gallon on such a liquid-measuring device as is described in the proviso of specification No. 4.*

18. PISTON DISPLACEMENT.—A defined-stroke liquid-measuring device shall be so designed and constructed that it will have a piston displacement per cycle of 231 cubic inches per indicated gallon of delivery.

19. ASSURANCE OF COMPLETE DELIVERY.—All liquid-measuring devices shall be so designed and constructed as to furnish assurance that all measured liquid which is apparently being delivered from that delivery outlet which is being employed in any particular operation of the liquid-measuring device, is actually being delivered so long as there is any liquid passing through this delivery outlet.

This specification is to be construed to require that all valves in the supply line intended to prevent the reversal of flow of the liquid shall be of such design and construction that their closure is automatically effected in the use of the device and that when two or more delivery outlets for the liquid are provided a delivery made through one delivery outlet shall not affect the subsequent delivery through any other delivery outlet. It is further to be construed that either (1) there shall be no means provided by which any of the measured liquid can be diverted from the measuring chamber or the discharge line to the supply tank or elsewhere during the period that liquid is flowing from the delivery outlet apparently in sole use, or (2) if there be any means whatever by which an incomplete delivery or any diversion of measured liquid can be accomplished or made, then the

device must be so designed and constructed that such fact will automatically become an immediately obvious one to anyone observing the operation of the device.

20. VALVES IN DISCHARGE LINE.—No liquid-measuring device shall be equipped with a discharge valve at the extremity of the hose or elsewhere in the hose line unless the device is so designed and constructed either that it must be operated with the hose full of liquid at all times or that the fact that the hose is drained will automatically become an immediately obvious one to anyone observing the operation of the device. In case the discharge valve is so positioned, any other valve not immediately adjacent thereto, in any portion of the discharge line leading to this outlet, shall be so designed and constructed that it can only be closed off in one of the following ways: (1) By the use of some tool or device which is outside of and entirely separate from the measuring device itself, such as a wrench, screw driver, etc., but not an adjusting pin; or (2) by the destruction of a seal. In case the latter construction is used means shall be provided so that a seal of the usual lead-and-wire type may readily be employed to seal the valve open and the manufacturer shall furnish his device with the valve sealed open; there shall be a metal tag or plate attached to the device adjacent to this valve handle clearly stating that the device should not be used unless the valve handle is secured by a seal.

This specification is not to be construed as allowing a discharge valve in the hose in the case of devices in which, without the fact being obvious to the observer, the hose or any part thereof can be drained of liquid after the actual mechanical operation of the mechanism of the liquid-measuring device is discontinued, in any way except as follows: (1) By means of the mechanically operated valve, or (2) by delivering from the measuring device more than the full measuring capacity thereof during the actual mechanical operation of the mechanism thereof.

A pressure-operated liquid-measuring device, that is, a liquid-measuring device not designed for discharge by gravity, when designed and constructed to be operated with the hose full

of liquid at all times shall be equipped with an effective anti-drain valve, incorporated in the discharge valve at the outlet end of the hose or installed immediately adjacent thereto, to prevent drainage of the hose.

21. DRAINAGE OF DISCHARGE LINE.—All liquid-measuring devices shall be so constructed and installed that they will provide for the complete and rapid drainage, to a definite and uniform level, of the liquid contained in the hose or outlet pipe, and will not permit a siphoning or a continuous trickle of liquid from the discharge outlet after the operation of the mechanism is discontinued.

This specification will be construed to require that if hose is used its inlet end shall be at least 5 feet above the normal level upon which the receiving vehicle or vessel stands and the liquid-measuring device shall be equipped with an automatic vacuum breaker or equivalent means to insure the complete and rapid drainage of the hose, that is required by the above. The hose shall be properly reinforced and shall be of such length and stiffness that no movable portion thereof will be readily disposed in such a way as to tend to retain liquid after the operation of the device is completed: Provided, however, That this specification shall not be construed to apply to devices which, under the terms of specification No. 20, may be equipped with two shut-off valves or cocks and are to be operated with the hose full of liquid at all times.

22. LIMITATION OF USE.—*Liquid-measuring devices which will not give correct results except when used with liquids having particular properties—as, for example, high viscosity—shall be conspicuously, clearly, and permanently marked to indicate this limitation. Such wording may take the form, “Not suitable for gasoline or light oils”, “Use only for molasses or heavy oils”, or “For viscous liquids only.”*

23. FRAUDULENT CONSTRUCTION.—All liquid-measuring devices and all devices designed to be attached thereto and used in connection therewith shall be of such design and construction that they do not facilitate the perpetration of fraud.

ADDITIONAL SPECIFICATIONS APPLICABLE TO RETAIL DEVICES ONLY

31. DEVICE TO INDICATE WHEN SYSTEM IS PROPERLY FILLED.—*Retail devices other than those of the visible type shall be equipped with a device which will indicate whether or not the system is properly filled before a delivery is begun. This specification shall not be construed to prohibit a manually operated valve in the standpipe, but shall prohibit a check valve in the discharge line in such a position that the partial emptying of the system would not be disclosed: Provided, however, That a check valve in the discharge line shall be permitted when an efficient air eliminator or other means is provided to prevent inaccuracies of measurement due to air or vapor in the liquid.*

32. INDICATION OF DELIVERY.—*All retail devices shall be so designed and constructed that the initial zero condition and the amount delivered up to the nominal capacity of the device shall be clearly and definitely indicated by automatic means, and this nominal capacity, if less than 50 gallons, shall be plainly and conspicuously indicated on each face of the device; the indication of any delivery shall take place only when the full discharge has, in fact, occurred: Provided however, That the requirement that the full discharge shall have been completed before registration shall not apply to the dribble flow caused by the displacement of a piston rod during the return of a piston to its initial position, when a clear statement conspicuous to the customer and adjacent to the indicating means is placed on the liquid-measuring device to the effect that the full amount cannot be delivered until the piston or the pointer or indicator has been returned to its initial position.*

33. SENSITIVENESS.—*All retail devices shall be so designed and constructed that they can readily be operated to deliver each quantity for which a graduation, stop, overflow pipe, or other indicating means is provided, within the tolerance on such amount hereinafter provided.*

This specification shall be construed to require that in the case of all devices which have a graduated scale or dial or similar indicating means which at some point or points or at all points constitutes the sole or most sensitive means of determining the amount of liquid discharged, the length on such scale or dial equivalent to the tolerance at any graduation must be readily

appreciable when the character of the indicating element and its normal distance from and position in reference to the observer's eye are taken into consideration; the gross, inside cross-sectional area of the measuring chamber shall in no case be less than 75 square inches nor more than 118 square inches and, if cylindrical, the inside diameter of the measuring chamber shall in no case be less than 9.75 inches nor more than 12.25 inches.

34. RETURN OF INDICATING ELEMENT TO ZERO.—Retail devices shall be so designed and constructed that the indicating elements used to tally sales and deliveries to individual purchasers or to indicate the amount delivered when any portion of the cycle or stroke has been completed, or the total price thereof, shall be returnable readily to a definite and clear zero indication before the next delivery is begun. Means shall be provided to prevent the indicating element from being returned beyond the zero graduation. The indicating elements may be advanced only by the mechanical operation of the device itself: Provided, however, That the device may be cleared by advancing the indicating elements to zero, but only when the means employed automatically results either in a movement that cannot be interrupted or in an obscuring of the registration, until the zero position is reached.

35. AUXILIARY VISIBLE INDICATING DEVICES.—*Whenever a retail device of the visible type is so designed and constructed that measured liquid continues to pass through the discharge valve for an appreciable time (3 seconds or more) after the liquid has disappeared from sight in the glass measuring chamber, then the device shall be equipped with an auxiliary visible indicating device, adjacent to the discharge valve and so constructed that it will indicate after the completion of the delivery when any portion of the measured liquid has not been discharged through such valve at the time of the closing thereof: Provided, however, That in the case of any nominal delivery which is such that it does not cause the liquid to disappear from the chamber, the time interval mentioned above shall be measured from the time that the liquid apparently ceases to fall in such chamber.*

Such auxiliary visible indicating device shall be so designed and constructed and so located and disposed that its indication is conspicuous and that, during the operation of the liquid-measuring device, it is clearly visible to and readable by the

customer. Whenever an auxiliary visible indicating device designed to indicate drainage of liquid and/or completeness of delivery shall be employed, whether or not it is required by the terms of this specification, it shall comply with all the above requirements.

36. TIME ALLOWED FOR COMPLETION OF DELIVERY.—All retail devices shall be so designed and constructed, or so calibrated, that they will deliver into the discharge line on the delivery side of the discharge valve, within the tolerances hereinafter provided, any nominal quantity which they are designed to deliver, within a period of 10 seconds after the main flow of liquid has ceased.

The main flow shall be construed to cease, in the case of a device of the piston type, at the completion of the upward stroke of the piston, and in the case of a device of the visible type, at the time of the disappearance of the liquid in the glass measuring chamber: Provided, however, That in the case of any nominal delivery which is such that it does not cause the liquid to disappear from the chamber, the time that the liquid apparently ceases to fall in such chamber shall be used in lieu of the time of the disappearance of the liquid: And provided further, That in the case of any retail device equipped with an auxiliary visible indicating device such as is described in specification No. 35, any conspicuous change of indication in this device, such as a sudden drop in the level of the liquid, occurring after the major portion of the delivery has been completed, shall be used in lieu of either of the indications mentioned above.

All tests and calibrations shall be made on the basis outlined above, that is, the delivery valve shall be closed, or the operation of the liquid-measuring device otherwise discontinued, at the termination of the period of time mentioned above, and the amount which shall then have been delivered shall be taken as the full delivery of the device for the nominal quantity being delivered.

NOTE.—This specification shall be limited to apply only to devices when used in the sale of motor fuels.

37. COMPUTING CHARTS.—When retail devices are equipped with money-value computing charts these shall be made in accordance with one of the following principles:

(a) If the device is so designed and constructed that it purports to compute for one or for a series of unit prices the total

price for every delivery within the range of the device, then the device shall be equipped with a value pointer or indicator and value graduation marks and figures; and in any position which the indicator or pointer and the value graduation marks and figures may assume, the total price of the amount delivered shall be clearly, definitely, and correctly indicated. The value graduations shall not exceed 1 cent at all prices per gallon up to and including 30 cents. At any higher price per gallon the value graduations shall not exceed 2 cents: Provided, however, That nothing in the above shall be construed to prevent the placing of a special value graduation to represent each 5-cent interval. These special graduations may take the form of dots, staggered graduations, or similar forms. They shall be so placed that their meaning and value may be clearly understood, but they shall not be placed in the space between the regular graduations.

(b) If the device is so designed and constructed that it purports automatically to compute only for deliveries corresponding to a definite series of quantity graduations, then one of the following alternatives shall be complied with: (1) There shall be a value computation for each quantity graduation throughout the range of the device; or (2) no value indications may be exposed to view except at such times that the device registers a quantity indication for which a correct value indication is provided; or (3) each value graduation or each column or row of such graduations shall be clearly and conspicuously marked with the quantity graduation to which the value corresponds and the device shall be marked with the character and limitations of the computations made. All money values corresponding to definite quantity graduations must be mathematically correct except as follows: If the mathematically correct amount includes a fractional part of a cent, the fraction shall be dropped if it is less than one-half, but if the fraction is one-half or more the next higher cent may be shown.

ADDITIONAL SPECIFICATIONS APPLICABLE TO WHOLESALE DEVICES ONLY

51. INDICATION OF DELIVERY.—Wholesale devices shall be so designed and constructed that the amount delivered shall be clearly and definitely indicated.

52. SENSITIVENESS.—Wholesale devices shall be so designed and constructed that they can readily be operated to deliver an amount of 50 gallons within the tolerances on

such amount hereinafter provided, and whenever any scale or dial is at some point or points or at all points the sole or most sensitive means of determining the amount of liquid discharged, a volume of 1 gallon shall be represented on such scale or dial by a length of not less than 0.20 inch.

53. TESTING DRAFTS.—In the test of a wholesale device, the minimum testing draft shall be 50 gallons.

NOTE.—In general, it is recommended that in the case of wholesale devices having high discharge rates the size of the regular testing draft should be increased to 100 or even several hundred gallons. The greater the discharge rate the more desirable it is to increase the size of the testing drafts.

TOLERANCES

Except in special tests described above, the tolerances to be allowed in excess or deficiency on all liquid-measuring devices shall be the values shown in the following table. Provided, however, That the manufacturers' tolerances or the tolerances on all new liquid-measuring devices shall be one-half of the values given: And provided further, That these latter tolerances shall also be applied to all devices which are being retested after having been found incorrect and subsequently adjusted or repaired.

Retail devices		Wholesale devices
Delivery	Tolerance	Tolerance
<i>Gallons</i>	<i>Cubic inches</i>	1 cubic inch per indicated gallon. (Minimum tolerance 50 cubic inches.)
1/2 or less	2	
1-----	3	
2-----	4	
3-----	5	
4-----	6	
5-----	7	
For each additional gallon add 1 cubic inch.		

REGULATIONS

1. PLUMB AND LEVEL INSTALLATION.—All liquid-measuring devices shall be installed plumb and level, and their installation shall be of such strength and rigidity as to maintain this condition.

2. SUCTION HEAD.—Any installation of a defined-stroke, piston-type, liquid-measuring device shall be such that the total suction head will not be sufficient to cause vaporization of the liquid for which the device is used under the highest temperature and lowest barometric pressure likely to occur.

3. METHOD OF OPERATION.—A liquid-measuring device shall be operated in accordance with the method which is obviously indicated by its construction or which is indicated by the manufacturer through the medium of instructions contained on the device itself; if the device is operated in any other manner, then the commercial use of the said device shall be prohibited and it shall be subject to condemnation.

4. USE OF ADJUSTMENTS.—No adjustment of the delivery of a defined-stroke liquid-measuring device shall be permitted except that intended to produce a piston displacement per cycle of 231 cubic inches per indicated gallon of delivery. Adjustments of piston displacement to correct for leaks, slippage, excessive length of pipe line, or other defects of the device or of the installation shall not be permitted.

5. RATE OF FLOW.—The installation of a wholesale device shall be such that the rate of flow through the device will not exceed the rated capacity of the device; if necessary to accomplish this result, effective automatic means for flow regulation shall be installed.

6. RETURN OF INDICATING ELEMENT TO ZERO.—*Any liquid-measuring device used in making retail deliveries to individual consumers shall conform to the requirements of paragraph 34 relative to the return of the indicating element to zero.*

GENERAL NOTE

CONFLICT OF LAWS AND REGULATIONS.—In the above specifications certain items appear which may conflict in certain jurisdictions with present State or local laws or ordinances or regulations of State or local fire marshals or boards of safety. In such cases of conflict an attempt should be made by the weights and measures officials to harmonize the two codes, and in the meanwhile it may be found necessary to suspend the enforcement of such specifications.

GREASE-MEASURING DEVICES

NOTE.—A grease weighing and dispensing device is a mechanism or machine adapted to weigh and deliver grease or transmission oil by weight. The following specifications and tolerances are not to be construed to apply to devices of this character, but only to devices of the character specifically defined below.

DEFINITION

A mechanically operated grease measuring and dispensing device, hereinafter referred to as a grease-measuring device, is a mechanism or machine adapted to measure and deliver grease or transmission oil by definite volume. This definition is not to be construed to include devices which are obviously designed and intended solely for high-pressure lubrication of bearings and similar parts or devices employed solely in operations where a flat rate is charged for the operation and no variation in the charge is made on account of the supposed amount of grease or transmission oil delivered. When a device is so used there shall be no indicating device or statement purporting to indicate that any definite weighed or measured quantity can be delivered by the device.

SPECIFICATIONS

1. **PERMANENCE.**—*All grease-measuring devices shall be of such design, construction, and materials that they may reasonably be expected to withstand ordinary usage without impairment of the accuracy of their measurement, or the correct functioning of their operating or indicating parts.*

2. **UNITS OF DELIVERY.**—*Grease-measuring devices shall have the following discharge capacities per stroke or per cycle of the primary indicating elements, and these only: One pint; a multiple of the pint; or a binary submultiple of the pint, that is, the quantity obtained by dividing the pint by the number 2 or a power of the number 2.*

3. **INDICATION OF DELIVERY.**—All grease-measuring devices shall be so designed and constructed that the initial zero condition and the total amount delivered to an individual purchaser shall be clearly and definitely indicated

in terms of liquid measure* by automatic means: Provided, however, That the capacity of the registering or tallying device demanded by the above shall not be required to be more than 5 pints: And provided further, That a device in use at the time these specifications take effect shall not be required to comply with the above requirement for automatic indication of the amount delivered when the device delivers, within the tolerances hereinafter provided, a unit quantity of a pint, a multiple of the pint, or a binary sub-multiple of the pint per stroke or per cycle of its operating elements, and when, in addition, the device is conspicuously and permanently marked to indicate the value of this unit quantity.

*NOTE.—Devices which at the time of adoption of these regulations in any jurisdiction are marked to deliver in pounds rather than in pints and which in other respects conform to the retroactive sections of this code or are susceptible of being made so to conform, should not be condemned and confiscated on this ground alone, but the word "pound" should be obliterated wherever it occurs and the word "pint" substituted therefor. In this case the device should be readjusted if necessary.

4. SENSITIVENESS.—All grease-measuring devices shall be so designed and constructed that they can *readily* be operated to deliver each quantity for which a graduation, stop, or other indicating means is provided, within the tolerance on such amount hereinafter provided, *and whenever any scale or dial is at some point or points or at all points the sole or most sensitive means of determining the amount of lubricant discharged, a volume of 1 pint shall be represented on such scale or dial by a length of not less than 1 inch.*

5. CONSTANCY OF DELIVERY.—*The amounts delivered by any grease-measuring device shall not vary from the standard by more than the tolerances hereinafter provided (1) irrespective of the speed at which the device is operated, except that in the case of devices operated by air pressure, when operated at an air pressure lower than the minimum pressure specified by the manufacturer, the tolerance shall be applied in deficiency only—that is, the device shall not be deemed to be incorrect by reason of the tolerance in excess being exceeded during such method of operation—and (2) irrespective of the time elapsing between operations. In the case of all devices operated by air pressure there shall be legibly marked on the dial of the air-pressure gage, by special graduations or otherwise, the maximum and minimum working pressures recommended by the manufacturer.*

6. INDICATING AND REGISTERING PARTS.—Counters and graduated scales and dials used on grease-measuring devices to tally sales and deliveries to individual purchasers or to indicate the amount delivered when any portion of the cycle or stroke has been completed, shall be of such size and style and shall be so located and disposed that they may be easily read. *The graduations shall be of such character and arrangement that the major ones are more prominent than and are clearly distinguishable from the minor ones. In all types of grease-measuring devices which utilize a graduated scale or dial to indicate the amount of lubricant discharged, the width of the graduation marks shall not exceed 0.04 inch.*

7. POINTERS AND INDICATORS.—*All pointers and indicators which when used in conjunction with a graduated scale or dial, indicate the amount of lubricant discharged shall be so shaped that a correct and accurate indication is given. Such pointers and indicators are required to be symmetrical about the graduation lines at which they may stand and shall reach to the finest graduation marks; the width of the end of the pointer or indicator shall not be greater than the width of such marks.*

8. PARALLAX.—*All grease-measuring devices in which the accuracy of the readings of any indicating mechanism is affected by parallax shall be so designed and constructed as to reduce to a minimum the errors due to this cause.*

9. GRADUATED SCALES.—When a grease-measuring device is provided with a graduated scale or dial, this shall be riveted or otherwise permanently attached to its supports.

10. NUMBERING OF GRADUATIONS.—*Figures defining the value of graduations shall be uniformly placed in reference to the graduation marks and shall be as close thereto as practicable, but shall not be so placed as to interfere with the accuracy of reading.*

11. LETTERING AND GRADUATIONS.—*All markings, instructions, figures, and graduations required under these specifications shall be of such size, design, material, and location, and shall be so applied or affixed, that they will not tend easily to become obliterated or illegible.*

12. MOVEMENT OF INDICATING ELEMENT.—*All grease-measuring devices shall be so designed and constructed that the indicating element used in tallying deliveries to individual purchasers shall be susceptible of forward movement only by*

the mechanical operation of the device itself. The indicating element shall be returnable readily to a definite and clear zero indication before the next delivery is begun. Means shall be provided to prevent the indicating element from being returned beyond the zero indication.

13. POSITIVE STOPS.—When stops or other stroke-limiting devices are employed on a grease-measuring device and these are subject to direct pressure or impact in the operation of the device, such stops shall be of such construction that the permanence and security of their positions is provided for by a positive, nonfrictional engagement of the parts whose relative motions are to be prevented. Such stops shall be so designed and constructed that adjustment within the prescribed tolerances can be made.

14. POSITIONING OF STOP MECHANISM.—All grease-measuring devices designed to deliver two or more different predetermined amounts by bringing into operation different stops or other means of defining the delivery, shall be so designed and constructed that the position for the proper setting of each stop is definitely and accurately defined, inadvertent displacement from this position is obstructed, and the delivery for which the device is set at any time is clearly and conspicuously indicated.

15. PROVISION FOR SEALING.—All devices adapted to be altered for adjusting or correcting the delivery of a grease-measuring device shall be of such construction that they can be sealed, either separately or together, in such a manner that the position of none of them can be changed without destroying the seal or seals.

16. PISTON DISPLACEMENT.—A defined-stroke grease-measuring device shall be so designed and constructed that it will have a piston displacement per cycle of 28.875 cubic inches per indicated pint of delivery.

17. ASSURANCE OF COMPLETE DELIVERY.—All grease-measuring devices shall be so designed and constructed that there shall be no means provided by which any of the measured lubricant can be diverted from the measuring chamber or the discharge line to the supply tank or elsewhere during the period of operation of the device. All valves in the supply line intended to prevent the reversal of flow of the lubricant shall be of such design and construction that their closure is automatically effected in the use of the device.

Each grease-measuring device shall be equipped with an effective anti-drain valve installed immediately adjacent to the outlet end of the hose, to prevent drainage of the hose.

18. LIMITATION OF USE.—*Grease-measuring devices which will not give accurate results except when used with lubricants having particular properties shall be conspicuously, clearly, and permanently marked to indicate this limitation.*

19. FRAUDULENT CONSTRUCTION.—All grease-measuring devices and all devices designed to be attached thereto and used in connection therewith shall be of such design and construction that they do not facilitate the perpetration of fraud.

20. INDICATION OF EXHAUSTION OF SUPPLY.—*All grease-measuring devices shall be provided with a device which will make the unit inoperable when the supply of grease or transmission oil has reached a point where the accuracy of delivery would be affected, or shall be so constructed as to warn the purchaser and the operator in a conspicuous and distinct manner that the level of the supply is so low as to endanger the accuracy of the measurement.*

TOLERANCES

Except under special conditions as described in specification No. 5, the tolerances to be allowed in excess or deficiency on all grease-measuring devices shall be $1\frac{1}{4}$ cubic inches (about $\frac{5}{8}$ liquid ounce) on a delivery of 1 pint or less; for deliveries of more than 1 pint add 1 cubic inch (about $\frac{1}{2}$ liquid ounce) per indicated pint: Provided, however, That the manufacturers' tolerances or the tolerances on all new grease-measuring devices shall be one-half of the values given: And provided further, That these latter tolerances shall also be applied to all devices which are being retested after having been found incorrect and subsequently adjusted or repaired.

REGULATIONS

1. USE OF ADJUSTMENTS.—No adjustment of the delivery of a defined-stroke grease-measuring device shall be permitted except that intended to produce a piston displacement per cycle of 28.875 cubic inches per indicated pint of delivery. Adjustments of piston displacement to correct for leaks, slippage, or other defects shall not be permitted.

VEHICLE TANKS

NOTE.—In determining the capacity of a vehicle-tank compartment, water is recommended as the testing medium. In testing the accuracy of a vehicle-tank meter, the testing medium should be liquid of the same character, or of approximately the same viscosity, as that of the liquid to be commercially measured. Whenever the testing medium is a petroleum product, due care should be exercised to reduce to a minimum inaccuracies caused by evaporation or by volume change resulting from change of temperature of the liquid.

DEFINITION

A vehicle tank is an assembly used for the delivery of liquids, comprising a tank, which may or may not be subdivided into two or more compartments, mounted upon a wagon, automobile truck, or trailer, together with its accessory piping, valves, meters, etc. The term "compartment" shall be construed to mean the entire tank whenever this is not subdivided; otherwise it shall mean any one of those subdivided portions of the tank which is designed to hold liquid.

SPECIFICATIONS APPLICABLE BOTH TO VEHICLE TANKS USED AS MEASURES AND TO VEHICLE TANKS EQUIPPED WITH METERS

1. **PERMANENCE.**—A vehicle tank shall be so designed and shall be of sufficiently substantial construction that it may reasonably be expected to withstand ordinary usage without impairment of the accuracy of the deliveries made therefrom; the shell and the bulkheads shall be of such construction that they will not become distorted under any condition of liquid lading.

2. **VENTING MEANS.**—Each compartment shall be provided with suitable venting means to prevent the formation of air pockets by permitting the escape of air from all parts of the compartment designed to be filled with liquid and to permit the influx of air to the compartment during the process of delivery.

3. MARKING.—All lettering and figures required under these specifications shall be of such size, design, material, and location, and shall be so applied or affixed, that they will not tend easily to become obliterated or illegible.

4. FRAUDULENT CONSTRUCTION.—All vehicle tanks and all devices designed to be attached thereto and used in connection therewith shall be of such design and construction that they do not facilitate the perpetration of fraud.

ADDITIONAL SPECIFICATIONS APPLICABLE ONLY TO VEHICLE TANKS USED AS MEASURES

5. FILL OPENINGS AND INDICATORS.—The fill opening shall be of such size that it can readily be determined whether or not the compartment has been properly filled or completely emptied, as the case may be, and that the attachment of the seal can be readily accomplished when such sealing is required by the terms of this specification: *Provided, however, That if the fill opening is circular its effective diameter shall in no case be less than 7½ inches, or if other than circular, it shall have an effective area of not less than 45 square inches.* An indicator shall be provided within the fill opening of each compartment; this indicator shall be permanently attached and shall be located approximately midway between the ends of the compartment. The indicator shall be so designed that it will clearly, distinctly, and unmistakably define the height to which the compartment must be filled in order to contain its marked capacity, and the change in height of the liquid surface at the index of the indicator equivalent to the volume representing the tolerance on the compartment capacity, shall in no case be less than 0.04 inch. An adjustable indicator and any removable part to which any indicator may be attached shall be so constructed that it or they can be sealed in place in such a manner that their position cannot be changed or that they cannot be removed without destroying or mutilating the seal or seals.

6. EXPANSION SPACE.—The indicator shall be so positioned that when a compartment is filled to the indicator there will remain an expansion space of not less than 0.75 percent of the nominal capacity of the compartment.

7. PROVISION FOR COMPLETE DELIVERY.—The tank and the delivery piping shall be so designed and constructed and shall be so mounted upon the vehicle that when this is standing upon a level surface complete delivery may be made from any compartment through the delivery faucets or valves whether other compartments are full or empty.

8. DISCHARGE THROUGH MANIFOLD.—When two or more compartments discharge through a manifold, effective and automatic means shall be provided to prevent the passage of liquid from the manifold into the discharge line from any compartment.

9. PIPING.—Vehicle tanks equipped with control or emergency valves, shall have such valves at the lowest point of outlet from each compartment, and the capacities of such compartments shall be construed as not including the capacity of the piping leading therefrom.

10. MARKING OF CAPACITY.—Each compartment of a tank shall be plainly and conspicuously marked with a designating letter or figure and each delivery faucet or valve shall be correspondingly marked to indicate the compartment of which it is the outlet. In addition, the tank shall be plainly and conspicuously marked to show the capacity, to the nearest half gallon, of each compartment *and such marking shall indicate that the capacities given are measured to the indicators provided. This latter marking shall be placed adjacent to the faucets or valves.*

ADDITIONAL SPECIFICATIONS APPLICABLE ONLY TO VEHICLE TANKS EQUIPPED WITH METERS

11. METER REQUIREMENTS.—Meters installed on vehicle tanks shall conform to all applicable requirements of the specifications for liquid-measuring devices of the wholesale type, except in so far as these may be modified by the following requirements.

12. RETURN OF INDICATING ELEMENT TO ZERO.—*Meters installed on vehicle tanks shall be so designed and constructed that the indicating element used to tally sales and deliveries to individual purchasers or to indicate the amount delivered when any portion of the cycle or stroke has been completed shall be returnable readily to a definite and clear zero indication before*

the next delivery is begun. Means shall be provided to prevent the indicating element from being returned beyond the zero graduation. The indicating element may be advanced only by the mechanical operation of the device itself: Provided, however, That the device may be cleared by advancing the indicating element, but in this event the indication shall be obscured and remain obscured, until the zero is reached.

An element designed for predetermining the amount of a delivery to be made shall not be construed to be an indicating element when such predetermining element is clearly differentiated from the indicating element so that it will not be mistaken therefor.

13. LOCATION OF METER.—The meter shall be so positioned that the indications may be easily and accurately read.

14. DISCHARGE LINES AND DELIVERY HOSE.—If the unit be designed for discharge by gravity, the delivery hose shall be as short as practicable and there shall be no shut-off valve at its outlet end. If the unit be designed for discharge by means of a pump, the delivery hose shall be of the wet-hose type with a shut-off valve at its outlet end, and immediately adjacent to this valve there shall be installed a spring-loaded check valve so adjusted that drainage of the hose will automatically be prevented. When two or more compartments discharge through a manifold and the discharge lines are equipped with independently operable discharge valves, the construction shall be such that deliveries will be accurate whether or not more than one of the valves are partially or wholly open.

15. DIVERSION OF MEASURED LIQUID.—No means shall be provided by which any measured liquid can be diverted from the measuring chamber of the meter or the discharge line therefrom.

16. AIR ELIMINATION.—Adequate provision shall be made for preventing the passage of air or vapor through the meter. In a gravity-discharge unit, if a mechanical air eliminator or other means, to prevent inaccuracies of measure due to air or vapor in the liquid, be not provided, provision shall be made for preventing a vortex at the point of discharge from the compartment whereby air might be drawn into the line

leading to the meter, and the meter shall be so mounted and the piping so arranged that the meter will not be drained of liquid during normal operation and that air will not be trapped in the meter inlet line when a compartment is filled. In a pump-discharge unit, a mechanical air eliminator or other means shall be provided in such a position that it will effectively prevent the passage of air or vapor through the meter. This air eliminator or other means shall be considered effective if the provisions of specification No. 17 are complied with.

17. CONSTANCY OF DELIVERY.—The amounts delivered shall not vary from the standard by more than the tolerances hereinafter provided, (1) during continuous or intermittent discharge of liquid; (2) at all speeds of pump operation; and (3) when the meter is operated at the maximum rate permitted by the installation, when operated at the rate represented or believed to be normal for the installation, and when operated at a rate approximately one-half the normal rate, or at a rate of approximately 20 gallons per minute, whichever is less.

NOTE.—Meters installed on vehicle tanks should be tested at each of the three discharge rates specified. The minimum testing draft shall be 50 gallons.

TOLERANCES

FOR VEHICLE TANKS USED AS MEASURES.—The tolerances to be allowed in excess or deficiency on all vehicle-tank compartments which are being tested by the weights and measures official for the first time, to verify the accuracy of a capacity marked by a manufacturer or user, shall be the values shown in the column headed "On first test" in the following table. The tolerances to be allowed in excess or deficiency on all subsequent tests made by the official, to verify the accuracy of a marked capacity, shall be the values shown in the column headed "On subsequent test." These tolerances are to be applied to the difference between the actual result of the calibration and the marked capacity of the compartment. Whenever the result of a calibration indicates that the marked capacity of a compartment is not accurate within the tolerance to be applied, if the capacity of the compartment is adjustable, then the marking shall be

changed in accordance with the provisions of specification No. 10, or the result of the calibration shall be taken as the basis of an adjustment and the adjustment shall be so made that the capacity of the compartment agrees as nearly as may be with such marked capacity; if the capacity of the compartment cannot be adjusted to agree with the marked capacity, then the marking shall be changed in accordance with the provisions of specification No. 10.

Capacity of compartment		Tolerances	
From—	Up to and including—	On first test	On subsequent test
<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>	<i>Gallons</i>
-----	175	1/2	1/2
175	325	1/2	1
325	475	3/4	1 1/2
475	575	1	2
575	725	1 1/4	2 1/2
725	875	1 1/2	3
875	975	1 3/4	3 1/2
975	1, 125	2	4
1, 125	1, 325	2 1/2	5
1, 325	1, 525	3	6
1, 525	1, 725	3 1/2	7
1, 725	2, 050	4	8
2, 050	2, 550	5	10
2, 550	3, 050	6	12
3, 050	3, 550	7	14
3, 550	4, 050	8	16

FOR VEHICLE TANKS EQUIPPED WITH METERS.—The tolerances to be allowed in excess or deficiency on meters installed on vehicle tanks shall be the same as those specified for liquid-measuring devices of the wholesale type, that is, 1 cubic inch per indicated gallon of delivery with a minimum tolerance of 50 cubic inches, for meters in use, and one-half of these values for new or reconditioned meters.

REGULATIONS

1. If a vehicle tank be damaged, repaired, or modified in any way which might affect the accuracy of measurement of its deliveries, it shall not again be used for measurement until inspected and, if deemed necessary, tested, by the weights and measures official.

2. When a vehicle tank is used as a measure, the vehicle shall stand upon a level surface during the filling of the compartments; during a delivery, the vehicle shall be so positioned as to insure complete delivery whenever the delivery is such that a compartment should be completely emptied.

3. *The value of the smallest unit of indicated delivery on a meter used for the measurement of retail deliveries of fuel oil shall not exceed 1 pint.*

DRY CAPACITY MEASURES

SPECIFICATIONS

1. Dry capacity measures, and baskets used as dry measures, shall be made of metal, well-dried wood, or composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming materially warped, bent, dented, distorted, or otherwise damaged.

2. Dry measures, and baskets used as dry measures when such are allowed by the other specifications, shall be of one of the following capacities only: 1 bushel, a multiple of the bushel, or a binary submultiple of the bushel, that is, a measure obtained by dividing the bushel by the number 2 or by a power of the number 2.

3. *The capacity of all dry measures, and baskets used as dry measures, shall be conspicuously, legibly, and permanently indicated on the side of the measure. This shall be in combination with the word "dry" in the case of measures in which the word "quart" or "pint" occurs. The letters shall be at least $\frac{1}{2}$ inch high and $\frac{1}{4}$ inch wide on measures having a capacity of 1 peck or less and at least 1 inch high and $\frac{1}{2}$ inch wide on those having a capacity of $\frac{1}{2}$ bushel or more.*

4. All dry measures having a capacity of $\frac{1}{2}$ bushel or less shall be cylindrical or conical in shape. If of the latter shape, the top diameter shall be greater than the bottom diameter, but never by an amount exceeding 10 percent of the latter. In no case shall the bottom diameter exceed the top diameter.

5. *The bottoms of all dry measures shall be perpendicular to the axis of the measure and shall be flat, or when made of metal may be slightly corrugated when such corrugations aid in strengthening the measure. Such corrugations, when employed, shall be parallel or radial straight lines only.*

6. Wooden dry measures having a capacity of more than 1 pint shall have a metal band firmly attached around the top. All metal dry measures shall be adequately reinforced around the top.

7. Dry measures, and baskets used as dry measures, having a capacity of 1 bushel or more shall be equipped with handles.

8. Dry measures, and baskets used as dry measures, shall be of such construction that the capacity is determined by the top rim of the measure, and no subdivided measures or baskets shall be allowed.

9. Dry measures shall not be double-ended; that is, have the bottom set part way up into the measure so that both ends may be utilized as measures, either of the same or of different capacities.

10. Dry measures, and baskets used as dry measures, shall not have adjustable or movable bottoms.

11. The minimum diameters of dry measures of various capacities shall conform to the following table:

Capacity of measure	Minimum diameter
	<i>Inches</i>
1/2 bushel.....	13 3/4
1 peck.....	10 7/8
1/2 peck.....	8 1/2
2 quarts.....	6 5/8
1 quart.....	5 3/8
1 pint.....	4

TOLERANCES

The tolerances to be allowed in excess and in deficiency on dry capacity measures, and baskets used as dry capacity measures, shall be the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new dry capacity measures

and baskets used as dry capacity measures shall be one-half of the values given:

Capacity of measure	Tolerance	
	In excess	In deficiency
	<i>Cubic inches</i>	<i>Cubic inches</i>
1 bushel.....	50.0	25.0
1/2 bushel.....	30.0	15.0
1 peck.....	16.0	8.0
1/2 peck.....	10.0	5.0
2 quarts.....	5.0	2.5
1 quart.....	3.0	1.5
1 pint.....	2.0	1.0
1/2 pint.....	1.0	.5
1/4 pint.....	.5	.3

REGULATIONS

1. Baskets shall not be used as dry measures when having a capacity of less than $\frac{1}{2}$ bushel.

BERRY BASKETS OR BOXES

SPECIFICATIONS

1. Baskets or boxes for berries or small fruits, of a capacity of 1 dry quart or less, shall be of one of the following sizes: 1 quart, 1 pint, or ½ pint, dry measure.

TOLERANCES

The tolerances to be allowed in excess and in deficiency on baskets or boxes for berries or small fruits, constructed of wood, shall be the values shown in the following table:

Capacity of box	Tolerance	
	In excess	In deficiency
	<i>Cubic inches</i>	<i>Cubic inches</i>
1 quart.....	3	1.5
1 pint.....	2	1.0
1/2 pint.....	1	.5

The tolerances to be allowed in excess and in deficiency on baskets or boxes for berries or small fruits, constructed of pasteboard or fiber, shall be the values shown in the following table:

Capacity of box	Tolerance	
	In excess	In deficiency
	<i>Cubic inches</i>	<i>Cubic inches</i>
1 quart.....	2.0	1.0
1 pint.....	1.0	.5
1/2 pint.....	.5	.25

SCALES

A. GENERAL DEFINITIONS

A-1. Application.—For purposes of these specifications, the following definitions shall apply.

A-2. Definitions.

A-2a. CAPACITY.

A-2a (1). NOMINAL CAPACITY OF SCALE.—The largest weight indication which can be obtained by the use of all of the reading elements in combination, including the amount represented by any removable weights furnished or ordinarily furnished with the scale, but excluding the amount represented by any extra removable weights not ordinarily furnished with the scale and excluding also the capacity of any auxiliary weighing attachment not contemplated by the original design of the scale: Provided, however, That when a scale is constructed to give weight indications in both the customary and metric systems, this definition shall be applied to the indications in one system only: And provided further, That in applying this definition the capacity of any fractional bar is to be included only when this exceeds $2\frac{1}{2}$ percent of the sum of the capacities of the remaining reading elements.

A-2a (2). CAPACITY OF READING FACE.—The maximum weight which may be indicated on the reading face, exclusive of the use of any unit weights or other elements.

A-2b. SENSIBILITY RECIPROCAL (SR).

A-2b (1). GENERAL DEFINITION OF SR.—The amount of weight required to move the position of equilibrium of the weighbeam, pointer, or other indicating device of a scale a definite amount, at the capacity or at any lesser load. SR does not apply to scales having reading faces which indicate directly in terms of weight, but no such reading face which is purely auxiliary to the scale mechanism—such as one, for instance, which may or may not be employed, as desired, in the determination of weight—shall exempt a scale from the SR requirement when this reading face is disconnected or detached.

A-2b (2). SR OF SCALES HAVING WEIGHBEAM AND TRIG LOOP.—The change in load required to move the weighbeam from a position of equilibrium at the center of the trig loop to a position of equilibrium at the top or at the bottom of the trig loop. (See also paragraph A-2b (4).)

A-2b (3). SR OF EQUAL-ARM SCALES, AND OF UNEQUAL-ARM SCALES WITHOUT TRIG LOOP.—The change in load required to move the lever system from its position of equilibrium when the scale is in proper balance to a position of equilibrium at either limit of its motion: Provided, however, That when the scale is properly equipped with a well-designed special balance-indicating device comprising two indicators which move in opposite directions, the SR is the change in load required to cause a relative change in the position of rest of the indicators equal to 0.04 inch. (See also paragraph A-2b (4).)

A-2b (4). SR OF SCALES EQUIPPED WITH OVER-AND-UNDER INDICATORS.—In the case of a scale equipped with a device comprising an indicator cooperating with a single balance-indicating or "zero" graduation, the SR is the change in load required to move the indicator from its position of equilibrium when the scale is in proper balance to a position of equilibrium such that there is a clear interval between adjacent edges of the indicator and of the graduation, equal to the appropriate value in the following table:

Class of scale	Clear interval
Small-capacity scales-----	<i>Inch</i> 0. 04
Large-capacity scales other than vehicle scales, livestock scales, and coal mine and tippie scales-----	. 12
Vehicle scales, livestock scales, and coal mine and tippie scales-----	. 25

In the case of a scale equipped as above with a device provided with a series of graduations which do not directly indicate weight values, the SR shall be as defined above, or the specified movement shall be increased to a value equal to one division on the graduated scale if this value is greater than that first specified.

A-2b (5). CLASSES OF SR.—Two classes of SR are established:

(a) Acceptance or adjustment SR: This is the manufacturers' SR, or the SR applicable to "new" scales as defined in paragraph A-2q.

(b) Maintenance SR: This is the users' SR, or the SR applicable to scales in use.

A-2c. SMALL-CAPACITY AND LARGE-CAPACITY SCALES.—The term "small-capacity" shall be construed to include all scales of the bench (counter) and hanging types having nominal capacities of 400 pounds or less. Scales other than small-capacity scales are to be considered large-capacity scales. A vehicle scale is a large-capacity scale designed to be used to determine the weight of a motor truck or wagon, loaded or unloaded.

A-2d. AUTOMATIC-INDICATING SCALE.—A scale in which is embodied or to which is attached a self-acting mechanism, the capacity of which may be equal to or less than the nominal capacity of the scale, through the agency of which the indicated weights of loads of various magnitudes may be obtained. This definition is not to be construed to include scales which automatically weigh out commodities in predetermined drafts, such as automatic grain hopper scales, packaging scales, etc.

A-2e. READING FACE.—That element of an automatic-indicating scale on which weight values are automatically indicated.

A-2f. VALUE OF MINIMUM WEIGHT GRADUATION.—The smallest weight value represented by the interval from the center of any graduation to the center of the next succeeding graduation on any weight-indicating element of the scale.

A-2g. COUNTERPOISE WEIGHTS.—Slotted weights designed to be manually applied near the tip of the weighing-beam of a multiplying-lever scale.

A-2h. UNIT WEIGHTS.—Weights contained within the housing of an automatic-indicating scale, designed to be mechanically applied to an element of the weighing mechanism.

A-2i. WEIGHBEAM OR BEAM.—An element comprising one or more bars which employ movable poises for indicating weight.

A-2j. **MAIN BAR.**—A principal bar of a weighbeam, of relatively large capacity as compared with the fractional bar which may accompany it.

A-2k. **FRACTIONAL BAR.**—An auxiliary bar of relatively small capacity used for obtaining indications intermediate between graduations on the main bar.

A-2l. **MAIN AND SUBORDINATE GRADUATIONS.**—Main graduations are those representing primary subdivisions the value of which should readily be ascertainable in order to facilitate the reading. All other graduations are subordinate graduations.

A-2m. **POISE.**—A movable weight mounted upon—or in the case of a removable poise, hung from—a weighbeam and used in combination with notches and/or graduations to indicate weight values.

A-2n. **NOSE-IRON.**—A slidably-mounted, manually-adjustable pivot assembly designed for changing the multiplication of a lever.

A-2o. **BALANCE.**

A-2o (1). **GENERAL DEFINITION.**—A scale is in balance, as the term is used herein, when it correctly gives a weight indication of zero when there is no load on the platform, plate, or other load-receiving element.

A-2o (2). **FOR NONAUTOMATIC SCALE WITHOUT BALANCE INDICATOR.**—A lever scale of the nonautomatic type not having an indicator and a graduated scale or arc is in balance when the beam comes to rest at, or oscillates through approximately equal arcs above and below, the center of the trig loop when one is provided; or a position midway between other stops when these are provided; or a horizontal position when no trig loop or other stops are provided.

A-2o (3). **FOR NONAUTOMATIC SCALE WITH BALANCE INDICATOR.**—A scale of the nonautomatic type having an indicator and a graduated scale or arc is in balance when the indicator comes to rest at, or oscillates through progressively smaller arcs about, a definite and clear zero graduation.

A-2o (4). **FOR AUTOMATIC-INDICATING SCALES.**—A scale of the automatic-indicating type—that is, one having a reading face—is in balance when the indicator comes to rest at a definite and clear zero graduation.

A-2p. **ACCURATE; CORRECT.**—A scale or weight is to be considered accurate, or as yielding proper weight indications, when its performance or value conforms to the standard within the applicable tolerances. A correct scale or weight is one which conforms to all applicable specification requirements, including tolerances and SR requirements.

A-2q. **NEW SCALES.**—Scales which are about to be put into use for the first time or which have recently been put into use and are being tested for the first time by the weights and measures official. Scales which have been reconditioned or overhauled or which have been condemned for repairs by a weights and measures official and subsequently adjusted or repaired shall, upon the first test thereafter, be construed to be “new” scales for the purpose of the application of tolerances and SR requirements.

A-2r. **TOLERANCE.**—A tolerance is a value defining the amount of the maximum allowable error or departure from true value or performance. Two classes of tolerances are established:

(a) Acceptance or adjustment tolerances: These are the manufacturers’ tolerances, or the tolerances applicable to “new” scales as defined in paragraph A-2q.

(b) Maintenance tolerances: These are users’ tolerances, or the tolerances applicable to scales in use.

A-2s. **TYPES OF SCALES.**

A-2s (1). **VEHICLE SCALE.**—A vehicle scale is a scale designed to determine the weight of a motor truck or wagon, loaded or unloaded.

A-2s (2). **LIVESTOCK SCALE.**—A livestock scale is a scale having a capacity of 6,000 pounds or more and used primarily for the weighing of livestock on the hoof.

A-2s (3). **COAL MINE OR TIPPLE SCALE.**—A coal mine or tippie scale is a scale used primarily for weighing lots of coal for the purpose of determining the wages of miners.

B. GENERAL SPECIFICATIONS

B-1. Application.—General specifications shall apply to all types and classes of commercial scales, and to other types and classes required to be examined by weights and measures officials, except insofar as these may hereinafter be modified by specific requirements for particular types and classes; they shall also be construed to apply to other apparatus, such as that used for special purposes, whenever and insofar as they are clearly applicable.

B-2. Specifications.

B-2a. CAPACITY MARKING.—*The nominal capacity shall be conspicuously, clearly, and permanently marked on every scale equipped with unit weights or with which removable weights are intended to be used.*

B-2b. STRENGTH, PERMANENCY, MAINTENANCE OF ACCURACY.

B-2b (1). GENERAL.—A scale shall be of such design, construction, and materials that it will support a load of its full nominal capacity without the development of undue stresses or deflections in the parts, and that it may be expected to withstand normal usage without undue impairment of its accuracy or the correct functioning of its operating or indicating parts; it shall be reasonably permanent in its adjustment and shall repeat its weight indications correctly.

B-2b (2). LEVEL-INDICATING DEVICE.—*Any scale which is portable and which is designed for use upon a counter or table, and any person-weigher, whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 percent or approximately 3° with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during the test contemplated by this paragraph.*

B-2b (3). STABILITY OF BALANCE CONDITION.—When the weighbeam or indicator of a scale is displaced from a position of equilibrium to the full extent allowed by the construction of the scale, it shall return to this position after

release. When a scale is equipped with a locking device or a relieving device or unit weights, repeated operation of the locking or relieving device or repeated application or removal of unit weights shall not materially affect the balance condition of the scale.

B-2b (4). INTERCHANGE OR REVERSAL OF PARTS.—Scale parts which may readily be interchanged or reversed in the course of normal usage shall be so constructed that their interchange or reversal will not materially affect the balance condition or the accuracy of the scale. *Scale parts which are susceptible of interchange or reversal in normal field assembly either shall be so constructed that their interchange or reversal will not materially affect the accuracy of the scale or the parts shall be so marked as to indicate proper positions.*

B-2b (5). MOVEMENT OF KNIFE-EDGES.—Under all operating conditions, proper lines of contact between knife-edges and their opposing bearings shall be maintained or restored. Platform scales having an outside frame around the platform shall be equipped with means which will prevent interference between platform and frame.

B-2b (6). ANTIFRICTION ELEMENTS.—*At all points at which a live part of the scale mechanism may come into contact with another part of the mechanism in the course of normal usage, frictional effects shall be reduced to a minimum through the agency of suitable antifriction elements; opposing surfaces and points shall be properly shaped, finished, and hardened to accomplish the result required.*

B-2c. BALANCING MEANS.—A scale shall be provided with a mechanical device or other means by which the balance condition may be adjusted. All loose material used for the balancing of a scale shall be securely enclosed.

B-2d. DEVICE FOR ADJUSTING BALANCE OR LEVEL.—All mechanical devices for adjusting the balance condition or the level of person weighers and of small-capacity scales except cream-test scales and prescription scales, shall be of such construction that they are operable or accessible only by the use of some tool or device which is outside of and entirely separate from the device in question, such as a screw driver, wrench, etc., but not an adjusting pin.

B-2e. PIVOTS.

B-2e (1). POSITIONING.—Pivots shall be firmly secured in or to the levers.

B-2e (2). MATERIAL AND DESIGN.—*Pivots shall be of hardened steel except that agate may be used for prescription scales. Knife-edges shall be sharp and shall bear throughout the entire length designed to be in contact with the opposing bearings.*

B-2f. BEARINGS.—*The entire surface of a bearing which is designed to be in contact with a knife-edge or point pivot shall be smooth and at least as hard as the opposing knife-edge or pivot point. For scales of 5,000 pounds capacity or more such bearings shall be made of hardened steel.*

B-2g. NOSE-IRON.—*The proper position of a nose-iron as determined by the factory adjustment, shall be clearly, accurately, and permanently indicated.*

B-2h. WEIGHBEAMS.

B-2h (1). POSITION.—*The normal position of a weigh-beam shall be horizontal, and it shall have equal travel above and below this position: Provided, however, That this requirement shall not apply to automatic-indicating scales.*

B-2h (2). STABILITY.—*The weighbeam of a scale shall not be accelerating—in unstable equilibrium—or in neutral equilibrium under normal operating conditions.*

B-2h (3). TRAVEL OF PANS OF EQUAL-ARM SCALE.—*The minimum travel of the pans between their limiting stops shall conform to the following:*

Scale capacity	Minimum travel of pans
	<i>Inch</i>
4 pounds or less.....	0. 35
Over 4 pounds, including 12 pounds.....	. 5
Over 12 pounds, including 26 pounds.....	. 75
Over 26 pounds.....	1. 0

B-2h (4). TRAVEL OF WEIGHBEAM.—*In the case of a beam scale equipped with trig loop or other suitable means at or near the weighbeam tip designed for establishing the proper balance position of the beam, the minimum travel of the beam in the trig loop or at such other reference point as may be provided, shall conform to the following:*

Distance from beam fulcrum to trig loop or reference point	Minimum travel of beam
12 inches or less-----	<i>Inch</i> 0.4
Over 12 inches, including 20 inches-----	.5
Over 20 inches, including 40 inches-----	.7
Over 40 inches-----	.9

In the case of a beam scale not equipped as described, the weighbeam shall have a minimum total angular play of 8 percent (approximately 5°).

(The angular motion of the beam in terms of percent may be obtained by dividing the total travel of the beam at its end by the distance from the fulcrum to the end of the beam and multiplying this quotient by 100.)

B-2h (5). READABILITY.—A weighbeam shall be so marked and graduated and a beam poise shall be so constructed that the weight corresponding to any normal position of the poise can be easily and correctly read directly on the beam. This requirement shall be fulfilled whether or not a registering or stamping device is used.

B-2h (6). POISE STOP.—A shoulder or stop shall be provided on a beam to prevent the poise traveling and remaining back of the zero graduation.

B-2h (7). WEIGHBEAM ON AUTOMATIC-INDICATING SCALE.—*On any automatic-indicating scale of a capacity of 30 pounds or less, the capacity of a bar or bars with which the scale may be equipped shall be an integral multiple of the capacity of the reading face. Each bar shall be subdivided throughout or shall be subdivided into notched intervals each equal to the capacity of the reading face, and the value of any turnover poise provided shall be equal to the capacity of the reading face.*

B-2i. POISES.

B-2i (1). CONSTRUCTION.—No part of a poise shall be easily detachable, and if a poise has a setscrew this shall not be removable.

B-2i (2). ATTACHMENT.—A poise shall not be readily detachable from the beam: Provided, however, That this requirement shall not apply to poises on steelyards unless there is a zero graduation on the beam.

B-2i (3). ADJUSTING MATERIAL.—The adjusting material in a poise shall be securely enclosed and firmly fixed in position; if of lead or other material softer than brass, it shall not be in contact with the beam.

B-2i (4). PAWL.—A poise on a notched weighbeam shall be provided with a pawl or other device which will cause the poise to be seated into a definite and correct position in each notch, wherever in the notch the pawl or other device is placed, and to be held there firmly and without appreciable movement. *That dimension of the tip of the pawl which is transverse to the longitudinal axis of the beam shall be equal to the corresponding dimension of the beam notches. The tip of the pawl shall be rounded off so that a small amount of foreign matter in the bottom of the notch will not prevent the poise from assuming its correct position.*

B-2i (5). READING EDGE OR INDICATOR.—The reading edge or indicator of a poise shall be sharply defined; a reading edge shall be parallel to the graduations on the weighbeam; an indicator shall reach to the graduations, or if the indicator and the graduations are in the same plane then there shall not be a separation of the ends of the graduations and the end of the indicator of more than 0.04 inch, this distance to be measured along the line of the graduations.

B-2i (6). HANGING POISE.—The bearing edge of a hanging poise shall be hard and sharp and shall be so formed as to allow the poise to swing freely in the notches of the weighbeam.

B-2j. WEIGHT GRADUATIONS.

B-2j (1). FORM.—The graduations on a weighbeam shall consist of lines, or of notches, or of a combination of these. All lines shall be uniform in spacing and parallel to each other. All notches shall be evenly cut, and the lines formed by the intersection of the sloping planes of their sides shall be uniform in spacing and parallel to each other. When a combination of lines and notches is employed, the lines shall be properly placed with reference to the notches so as to indicate the value of each notch clearly and correctly.

B-2j (2). CHARACTER, WIDTH, MARKING.—Weight graduations on a weighbeam or reading face shall be clear and distinct and *in no case shall their width be less than 0.008 inch—except as provided in paragraph B-2j (4)—nor more than the width of the minimum clear interval between the graduations.* On any bar of a beam, all graduations shall be equal in width. On any reading face, corresponding graduations shall be equal in width and main graduations shall not be more than 50 percent wider than subordinate graduations. The graduations on a beam or reading face shall be of such character and arrangement and shall be so numbered that all weight indications may be accurately read.

B-2j (3). CLEAR INTERVAL BETWEEN GRADUATIONS.—The clear interval between weight graduations on a weighbeam or reading face shall not be less than 0.04 inch, except as provided in paragraph B-2j (4). This interval is to be measured between the adjacent edges of successive graduations representing the smallest subdivision and along the line of travel of the index of the indicator or poise. The required interval shall be maintained whether or not the graduations are “staggered” or arranged alternately; that is, when the graduations are staggered the interval shall be construed to be the space from one graduation to the next consecutive graduation extended, if necessary, to intersect the line of measurement. When the graduations on a reading face are not parallel the interval shall be construed to be the widest separation of the graduations which is included within the travel of the index of the indicator. When the graduations are not equally spaced throughout the range of a reading face, the interval is to be measured between the graduations most closely spaced.

B-2j (4). MAGNIFIED INDICATING ELEMENTS.—When in normal usage any indicating elements are necessarily viewed as magnified by means of a lens system, the requirements of paragraph B-2j (2) as to minimum width of graduations and of paragraph B-2j (3) shall be that the apparent size of the magnified image of such elements as seen by an observer occupying a normal average position with respect to the scale shall be equivalent to the apparent size of elements complying with the stated requirements and viewed by the unaided eye from a normal distance.

B-2j (5). WEIGHT VALUES.—For any particular series of weight graduations on a weighbeam or reading face, the values of the subdivisions shall be uniform throughout the graduated interval.

B-2k. ATTACHMENT OF INDICATING ELEMENTS ON AUTOMATIC-INDICATING SCALES.—On an automatic-indicating scale, the reading face, or the indicator, whichever is designed as the stationary element, shall be securely fixed in position; the moving element of the combination shall be securely attached to its operating mechanism: Provided, however, That this specification shall not be construed to prohibit the employment of a movable auxiliary reading face or a movable auxiliary indicator designed to be rotated or moved in reference to a fixed reading face or a fixed indicator, respectively, for the purpose of "balancing out" tare weights or for similar uses.

B-2l. ZERO INDICATION ON AUTOMATIC - INDICATING SCALES.—An automatic-indicating scale shall have a definite and clear zero graduation and shall be susceptible of giving an indication back of the zero graduation sufficient clearly to disclose an out-of-balance condition. These requirements shall be fulfilled whether the entire reading face is graduated or the graduations commence at a fixed load.

B-2m. WEIGHT INDICATORS ON AUTOMATIC-INDICATING SCALES.

B-2m (1). DESIGN.—A weight indicator on an automatic-indicating scale shall be so designed and constructed that its indications are definite and may be read with precision.

B-2m (2). LENGTH.—The indicator shall reach to the graduations; or if the indicator and the reading face are in the same plane then there shall not be a separation of the ends of the graduations and the end of the indicator, of more than 0.04 inch, this distance to be measured along the line of the graduations.

B-2m (3). WIDTH.—*The relation between the widths of the indicator and the graduations with which it cooperates shall be as follows: If all graduations are of equal width, the width of the index of the indicator shall be equal to the width of the graduations; if main graduations are wider than subordinate graduations, the width of the index of the indicator shall not exceed the width of the main graduations and shall not be less than the*

width of the subordinate graduations. When an indicator extends along the entire length of a graduation then that portion of the indicator which may be brought into coincidence with the graduation shall be the same width throughout.

B-2m (4). CLEARANCE—GENERAL.—*The clearance between the index of the indicator and the reading face shall not exceed 0.06 inch—except as is provided in paragraph B-2m (5)—in the case of all automatic-indicating scales except uncompensated spring scales—that is, spring scales not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, or not so designed as to be substantially independent of such changes; in this latter class of scales this clearance shall not exceed 0.12 inch. Provided, however, That this shall not be construed to prohibit the employment of an additional indicator at a greater distance from the reading face, designed and constructed so as to facilitate the correct positioning of the eye of the observer properly to read the indications of the scale and reduce parallax, when such additional indicator is clearly differentiated from the weight indicator so that it will not be mistaken therefor.*

B-2m (5). CLEARANCE WHEN INDICATIONS ARE MAGNIFIED.—*When in normal usage any weight indicator and reading face are necessarily viewed or may be viewed as magnified by means of a lens system, the requirement of paragraph B-2m (4) as to maximum clearance between the index of the indicator and the reading face shall be that the specified maximum clearance shall be reduced in inverse proportion to the angular magnification of the lens system.*

B-2n. DAMPING DEVICE.—*An automatic-indicating scale shall be equipped with an effective dash-pot or other equivalent damping means whenever the incorporation of such a device is necessary in order to bring the indicating elements quickly to rest.*

B-2o. UNIT WEIGHTS.—*The total value of all unit weights in place at any time shall be automatically indicated on the reading face. The mechanism for applying and removing unit weights shall be positive in its operation and shall provide for the rapid addition and removal of unit weights one at a time; it shall be controlled by means conveniently located and operated in a simple manner from the outside of the housing;*

it shall function properly irrespective of the speed of manipulation.

B-2p. SECURITY OF ADJUSTMENT OF AUTOMATIC-INDICATING MECHANISM.—A pendulum, a spring, or other corresponding automatic-indicating weighing element shall be securely held in adjustment and shall not be adjustable from the outside of the scale; that is, a partial disassembling of the scale mechanism or of the housing shall be required to reach any adjustable parts provided. (This requirement is not to be construed to include within its purview the means provided for adjusting the zero balance condition of a scale.)

B-2q. SCOOP COUNTERBALANCE.—A scale shall not be equipped with a scoop counterbalanced by a removable poise or weight. When a scale is equipped with a permanently attached device intended to counterbalance the weight of a removable scoop, this device shall clearly indicate on both sides of the scale whether the scoop should be on or off the scale.

B-2r. DRAINAGE OF PAN.—The pan or platform of a scale intended for the weighing of wet fish or other wet commodities shall be so constructed as to provide for drainage.

B-2s. HOOKS.—If a scale is provided with a hanging pan, this shall be suspended from a ring and no hook will be allowed. A hook may be used only on a scale for which no pan is provided.

B-2t. INSTALLATION.

B-2t (1). GENERAL.—*The installation of any scale shall be such as to insure the necessary protection against wind and weather effects for the lever system and the under side of the platform.*

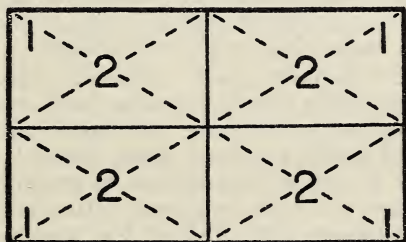
B-2t (2). FIXED-LOCATION TYPES.—The foundations and supports of any scale installed in a fixed location shall be such as to insure adequate strength, rigidity, and permanence; *all working parts of the scale shall be in proper condition as to level and vertical alinement*; adequate clearances shall be provided around all live parts.

B-2u. FACILITATION OF FRAUD.—A scale shall be of such design and construction that it does not facilitate the perpetration of fraud.

B-2v. CENTER-LOAD TEST OF SCALES.—When a scale is

tested with increasing loads approximately centered on the load-receiving element, the accuracy and sensitiveness of the scale shall conform to the appropriate tolerances and SR requirements hereinafter given.

B-2w. SHIFT TEST OF SCALES.—A scale having four main load bearings shall give results accurate within tolerance when a load of one-quarter capacity or less is placed so that its center of gravity lies as nearly as may be over any one of the main load bearings, as indicated by the points designated 1 in the following diagram, and when a load of one-half capacity ~~or more~~ is so placed at the center of any quarter of the platform, as indicated by the points designated 2 in the following diagram: Provided, however, That in the case of



a vehicle scale, the tolerance to be applied to the results on the corner shall be twice the tolerance which would otherwise be applied, but the algebraic mean of the errors on the two corners at each end of the scale shall not exceed such regular tolerance.

On any scale having a stabilized load-receiving element—that is, one mounted above the lever system on two load bearings and maintained in position by means of a stabilizing linkage—when a load of one-half capacity is placed so that its center of gravity lies over any point halfway between the center and edge of the load-receiving element, the error shall not differ from the error on center loading by more than the tolerance “on ratio” for the load in question, as contained in the column so headed in table 3, subject, however, to the limitations as to minimum tolerances.

B-2x. INCREASING-AND-DECREASING-LOAD TEST OF AUTOMATIC-INDICATING SCALES. When tests are being made with

both increasing and decreasing loads on an automatic-indicating scale, the indications on all increasing loads shall be within the regular tolerances specified, and also at any given load the range between corresponding observations for increasing and decreasing loads shall not be greater than the sum of the tolerances in excess and in deficiency for the load in question.

B-2y. OVER-AND-UNDER INDICATORS.—*An over-and-under indicator which does not directly indicate weight values, whether it is integral with or is attached to a scale, shall conform to the requirements of sections B-2j, B-2k, B-2l, B-2m, and B-2n, insofar as these requirements are applicable.* The attachment to a scale of an over-and-under indicator which directly indicates weight values shall be construed as constituting such scale an automatic-indicating scale, and all requirements for such scales shall apply accordingly.

B-2z. WEIGHT REGISTRATION.—When a scale is equipped with weight registering means, whether such means be integral with or attached to the scale, the registering means shall be susceptible of giving accurate, clear, distinct, and definite representations of weight throughout its designed operating range; in the case of a scale equipped with unit weights, the weight representations shall include the values of any unit weights applied. The requirements of sections B-2j, B-2l, B-2m, K-6b, and K-6c shall apply to weight registrations insofar as these requirements are applicable, and these requirements shall be broadly applied to appropriate portions of the said weight registrations so as to require a comparable degree of accuracy, clearness, definiteness, precision of reading, etc., in the case of weight registrations and of weighbeam and reading-face weight indications.

C. SPRING SCALES

C-1. Definitions.

C-1a. **SPRING SCALE.**—A spring scale is an automatic-indicating scale in which the weight indications result from the change of shape or of dimensions of an elastic body or system of such bodies. A scale in which metallic bands or strips are employed for the primary purpose of fulfilling the functions of pivots and bearings shall not be considered to be a spring scale within the meaning of this definition.

C-1b. **COMPENSATED AND UNCOMPENSATED SPRING SCALES.**—A compensated spring scale is one equipped with a device intended to compensate for changes in the elasticity of the spring or springs due to temperature effects, or one so designed as to be substantially independent of such changes. An uncompensated spring scale is one not equipped, or not designed, as described above.

C-1c. **STRAIGHT-FACE SPRING SCALE.**—A straight-face spring scale is a spring scale in which an indicator is affixed to a spring without intervening mechanism and registers the extension of the spring on a straight graduated face.

C-2. Specifications.

C-2a. **SPRING SUPPORT.**—The support for the spring of a straight-face spring scale shall be permanently affixed to the frame of the scale.

C-2b. **READING FACE.**—The reading face of a straight-face spring scale shall be firmly riveted to the frame at not less than three points.

C-2c. **GRADUATIONS.**—On a straight-face spring scale *the clear intervals between graduations shall not be less than 0.04 inch* and the values of the graduations shall satisfy the requirements of the following table:

Capacity	Maximum value of interval	Capacity	Maximum value of interval
<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>	<i>Pounds</i>
25	$\frac{1}{2}$	300	5
50	1	400	5
100	1	500	5
200	2		

D. COMPUTING SCALES

D-1. Definition.—A computing scale is a scale which, in addition to indicating the weight, indicates the total price of the amount of commodity weighed, for a series of unit prices, throughout all or a portion of the weighing range of the scale.

D-2. Specifications.

D-2a. INDICATIONS TO BE CORRECT.—A computing scale shall be correct in both its weight and value indications. There shall be no duplication of value figures or graduations in any given column or row on a computing scale chart.

D-2b. INDICATORS.

D-2b (1). GENERAL.—A computing scale shall be equipped with weight indicators on both the dealers' and customers' sides, and with a value indicator on the dealers' side, and the width of such indicators shall not exceed 0.015 inch. Except as is provided in paragraph D-2b (2), the clearance between the indexes of the weight and the value indicators and the reading face and chart shall not exceed 0.06 inch: Provided, however, That this shall not be construed to prohibit the employment of an additional indicator at a greater distance from the chart, designed and constructed so as to facilitate the correct positioning of the eye of the observer properly to read the indications of the scale and reduce parallax, when such additional indicator is clearly differentiated from the weight or the value indicator so that it will not be mistaken therefor.

D-2b (2). CLEARANCE WHEN INDICATIONS ARE MAGNIFIED.—When in normal usage any weight or value indicator and reading face or chart are necessarily viewed or may be viewed as magnified by means of a lens system, the requirement of paragraph D-2b (1) as to maximum clearance between the indexes of the indicators and the reading face and chart shall be that the specified maximum clearance shall be reduced in inverse proportion to the angular magnification of the lens system.

D-2c. GRADUATIONS.

D-2c (1). VALUE OF.—*The value of the value graduations on a computing scale chart shall not exceed 1 cent on all prices per pound up to and including 30 cents; at any higher price per*

pound the value shall not exceed 2 cents: Provided, however, That this shall not be construed to prevent the placing of a special value graduation to represent each 5-cent interval. These special graduations may take the form of dots, staggered graduations, or similar forms; they shall be so placed that their meaning and value may be clearly understood, but they shall not be placed in the space between the regular graduations.

D-2c (2). *WIDTH.*—The weight graduations and the value graduations shall be clear and distinct, but in no case shall their width be less than 0.008 inch—except as provided in paragraph D-2c (4)—nor more than the width of the minimum clear interval between the graduations.

D-2c (3). *CLEAR INTERVAL BETWEEN.*—Except as provided in paragraph D-2c (4), the clear interval between the weight graduations on all computing scales shall not be less than 0.04 inch, and the clear interval between the value graduations shall not be less than 0.02 inch: *Provided, however, That this shall not be construed to apply to the special value graduations denoting 5-cent intervals, mentioned in paragraph D-2c (1).*

D-2c (4). *MAGNIFIED INDICATING ELEMENTS.*—When in normal usage any indicating elements are necessarily viewed as magnified by means of a lens system, the requirements of paragraph D-2c (2) as to minimum width of graduations and of paragraph D-2c (3) as to minimum clear interval between graduations shall be that the apparent size of the magnified image of such elements as seen by an observer occupying a normal average position with respect to the scale shall be equivalent to the apparent size of elements complying with the stated requirements and viewed by the unaided eye from a normal distance.

D-2d. *READABILITY.*—A computing scale equipped with a drum-shaped chart shall be so constructed that the opening on the dealers' side discloses at least two value graduations at the lowest price per pound, and that the opening on the customers' side discloses a sufficient number of weight graduations so that at any load within the weighing range of the scale the weight indication can be correctly read.

E. CREAM-TEST AND BUTTERFAT-TEST SCALES

E-1. Definition.—A cream-test or butterfat-test scale is a scale especially designed and adapted for determining the butterfat content of cream or butter.

E-2. Specifications.

E-2a. INDICATING DEVICES.

E-2a (1). TO BE PROVIDED.—*A cream-test or butterfat-test scale shall be provided with a graduated scale or arc divided into at least 10 equal spaces, over which the indicator shall play to indicate the balance condition of the scale.*

E-2a (2). DESIGN OF ARC.—*The clear interval between the graduations on the graduated scale or arc shall not be less than 0.04 inch: Provided, however, That when in normal usage the indicating elements are necessarily viewed as magnified by means of a lens system, the requirement of this paragraph as to minimum clear interval between graduations shall be that the apparent size of the magnified image of such elements as seen by an observer occupying a normal average position with respect to the scale shall be equivalent to the apparent size of elements complying with the stated requirement and viewed by the unaided eye from a normal distance.*

E-2a (3). DESIGN OF INDICATOR.—The indicator shall be of such length as to reach to the graduated divisions; or if the construction is such that the indicator and graduated scale are in the same plane, then there shall not be a separation of the ends of the graduations and the end of the indicator of more than 0.04 inch, this distance to be measured along the line of the graduations. The indicator shall terminate in a fine point to enable the readings to be made with precision.

E-2b. LEVELING MEANS.—*A cream-test or butterfat-test scale whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 percent or approximately 3° with the horizontal, shall be equipped with leveling screws.*

E-2c. **SHIFT TEST.**—A cream-test scale shall be so designed and constructed that when an 18-gram weight is shifted to any position on the scale pan normally occupied by a cream-test bottle or to any position on the scale pan in which an 18-gram weight may reasonably be placed when samples are being weighed, the error shall not differ from the error on center loading by more than 1 grain, or approximately 65 milligrams.

F. PRESCRIPTION SCALES AND BALANCES

F-1. Application.—Class A prescription scales and balances may be used for all determinations of the character specified in the definition following. In the case of a drug store doing prescription work, which is provided with a class A prescription scale or balance, then and in that case only a class B prescription scale or balance may be approved for use, but only for the weighing of loads of 10 grains or more. The specifications and tolerances for class A prescription scales and balances shall also apply to scales used in the purchase and sale of gold, insofar as they are applicable.

F-2. Definition.—Prescription scales and balances are scales and balances designed for or adapted to weighing the ingredients of medicinal and other formulas prescribed by physicians and others and entering into the ordinary trade of pharmacists and chemists, and which are used or intended to be used for such purpose. These scales or balances shall be of two classes, class A and class B. A class A scale or balance is one which meets sensibility reciprocal and tolerance requirements given hereinafter for class A prescription scales and balances. A class B scale or balance is one which is somewhat less sensitive and accurate than a class A scale or balance, but which complies with the sensibility reciprocal and tolerance requirements given hereinafter for class B prescription scales and balances.

F-3. Specifications.**F-3a. INDICATING MEANS.**

F-3a (1). TO BE PROVIDED.—A prescription scale or balance shall be equipped with means which will accurately indicate its condition of balance.

F-3a (2). TYPES.—The indicating means may consist of one indicating edge, line, or point, and a graduated scale or arc; or of two indicating edges, lines, or points. The design shall be such that when the beam vibrates one or both of the elements will oscillate with reference to the other.

F-3a (3). DESIGN.—If the indicating means consists of a single indicating edge, line, or point and a graduated scale or arc, then the graduated scale or arc shall be divided into equal spaces with at least 0.04 inch clear interval between

the graduations, and the edge, line, or point shall reach to the graduated scale; or if the construction is such that the indicator and graduated scale are in the same plane, then there shall not be a separation of the ends of the graduations and the end of the indicator of more than 0.04 inch, this distance to be measured along the line of the graduations. The indicator shall be so designed and constructed as to enable the readings to be made with precision. If the indicating means consists of two indicating edges, lines, or points, these shall be sharply defined, *and shall in no case be more than 0.04 inch from each other when the scale is in balance, this space to be measured horizontally.*

F-3a (4). CLEARANCE.—*The distance between the graduated scale and the indicator shall in no case exceed 0.04 inch:* Provided, however, That this shall not be construed to prohibit the employment of an additional indicator at a greater distance from the graduated scale, designed and constructed so as to facilitate the correct positioning of the eye of the observer properly to read the indications of the scale and reduce parallax, when such additional indicator is clearly differentiated from the regular indicator so that it will not be mistaken therefor.

F-3b. PIVOTS AND BEARINGS.—Pivots and bearings of prescription scales and balances shall be made of hardened steel or of agate.

F-3c. ARRESTING MEANS.—A prescription scale or balance shall be provided with a device for arresting the vibration of the mechanism.

F-3d. MARKING OF CLASS B SCALES.—A class B prescription scale or balance shall be conspicuously and clearly marked with the words "Class B. Not to be used in weighing loads of less than 10 grains", or with a similar and suitable wording conveying the same information. (In the case of class B prescription scales and balances, which are hereafter manufactured in the State or brought into the State, this requirement shall be fulfilled by the manufacturer. In all other cases the inscription shall be placed upon such scales and balances by the weights and measures official.)

F-3e. ASSUMED CAPACITY.—For the purpose of applying the SR requirements and tolerances hereinafter given, the capacity of all prescription scales and balances which are in the State, either in use or in the stock of manufacturers of or dealers in such apparatus, and which shall not have the nominal or rated capacity marked upon them, shall be taken to be 1 apothecaries' ounce (or 30 grams)

G. PERSON WEIGHERS

G-1. Application.—The specifications for person weighers shall apply in those cases in which person weighers are used or to be used commercially—that is, when a charge is made for the weighing service—and such use shall be permitted only when such specifications are complied with. They are not to be applied to scales specifically designed for the weighing of infants and children. Whenever non-commercial person weighers are inspected and tested by the weights and measures official, it is recommended that these be officially sealed only when they comply with these specifications and the tolerances given hereinafter.

G-2. Definitions.

G-2a. PERSON WEIGHER.—A scale of any type which is specially designed for the weighing of persons.

G-2b. BEAM PERSON WEIGHER.—A person weigher in which weight indications are obtained by the manipulation of one or more weighbeam poises.

G-2c. AUTOMATIC-INDICATING PERSON WEIGHER.—A person weigher in which weights are automatically indicated on a reading face of any type.

G-2d. TICKET PERSON WEIGHER.—A person weigher in which a representation of each individual weight is automatically made upon a ticket, card, etc., which is automatically delivered to a suitable receptacle on the outside of the scale.

G-3. Specifications.

G-3a. CAPACITY.—A person weigher shall have a capacity of not less than 250 pounds.

G-3b. ZERO INDICATION.—*A person weigher shall be so designed and constructed that it has a definite and clear zero graduation and gives a definite and clear indication of its zero balance condition at all times when ready for use. In the case of an automatic-indicating or ticket person weigher, the zone throughout which the zero balance condition is indicated shall correspond to at least 5 pounds on each side of the zero graduation.*

G-3c. WEIGHT INDICATIONS.

G-3c (1). GENERAL.—*A person weigher shall be so designed and constructed that it is susceptible of giving weight indications at all points between zero and capacity: Provided, however, That a person weigher may have an interval between zero and some definite weight value throughout which weight values are not given, but in this case the person weigher shall be so designed and constructed that whenever the weight on the platform is such as to fall within this interval, any coin inserted will be returned to the user through automatic delivery to a suitable receptacle on the outside of the person weigher, or the insertion of a coin in the coin slot will automatically be prevented.*

G-3c (2). MAXIMUM VALUE ALLOWABLE.—The maximum value of the minimum weight graduations on a person weigher shall be 1 pound.

G-3d. INSTRUCTIONS TO BE MARKED.—A person weigher which is liable to give incorrect results except when special precautions are observed shall have appropriate and explicit instructions conspicuously, clearly, and permanently marked upon it.

G-3e. MEANS FOR AFFIXING CONDEMNING TAG.—*A person weigher shall be so designed and constructed as to facilitate the affixing by the weights and measures official of a condemning tag by means of a wire in such a way that the insertion of a coin in the coin slot will be prevented when the device is under condemnation.*

G-3f. EXHAUSTION OF TICKET SUPPLY.—*A ticket person weigher shall be so designed and constructed that throughout a period when the supply of tickets is exhausted, any coin which is inserted will be returned to the user through automatic delivery to a suitable receptacle on the outside of the person weigher, or the insertion of a coin in the coin slot will automatically be prevented.*

G-3g. TIME OF PRINTING TICKET.—A ticket person weigher shall be so designed and constructed that the printing, stamping, or transferring of the weight record on the ticket will not occur until the weighing mechanism has had ample opportunity to come to rest, under normal person-weighing conditions.

G-3h. REPRESENTATION OF WEIGHT.

G-3h (1). GENERAL.—A ticket person weigher shall be so designed and constructed that it is susceptible of giving a clear, distinct, and definite statement or representation of weight on the weight ticket: Provided, however, That if there is an interval between zero and a definite weight value throughout which tickets are not given, then, when a weighing within this interval is attempted, the coin shall be returned or the insertion of a coin in the coin slot shall automatically be prevented, as provided in paragraph G-3c (1), or the weight value shall be indicated on a reading face.

G-3h (2). REQUIREMENTS APPLICABLE.—Paragraph G-3h (1) shall be construed to require that the provisions relative to weight indicators, weight graduations, clear intervals between weight graduations, etc., for person weighers and automatic-indicating scales, shall apply to the representations of weight made by a ticket person weigher, when this representation is such as to make these requirements applicable. These requirements shall be broadly applied to appropriate portions of the said representations so as to require the same degree of clearness, definiteness, precision of reading, etc., in the case of both ticket and automatic-indicating person weighers.

H. WHEEL-LOAD WEIGHERS

H-1. **Application.**—Wheel-load weighers are intended solely for official use in the enforcement of traffic or highway laws; when sealed by the weights and measures official they are to be sealed for this purpose only, and are never to be allowed in commercial use.

H-2. **Definition.**—Wheel-load weighers shall, for the purpose of the application of the tolerances hereinafter given, mean portable devices designed for determining the wheel loads of vehicles on highways.

I. SENSIBILITY RECIPROCAL (SR) REQUIREMENTS**I-1. FOR LARGE-CAPACITY SCALES.**

I-1a. LARGE-CAPACITY SCALES EXCEPT RAILWAY TRACK SCALES.—The maximum maintenance SR allowable [applicable to scales in use], at the capacity of the scale or at any lesser load, shall be the value of two of the minimum weigh-beam graduations, except that the maximum maintenance SR allowable on a vehicle scale shall in no case be less than 10 pounds. The maximum acceptance and adjustment SR allowable [applicable to "new" scales as defined in paragraph A-2q], whether or not the scale is a vehicle scale, shall be the value of one of the minimum weighbeam graduations. Provided, however, That in the case of a scale of a capacity of more than 60,000 pounds, the maximum maintenance SR allowable shall in no case exceed 40 pounds, and the maximum acceptance and adjustment SR allowable shall in no case exceed 20 pounds.

I-1b. RAILWAY TRACK SCALES.—The maximum maintenance SR allowable on a railway track scale except one in grain-weighing service, at the capacity of the scale or at any lesser load, shall be 100 pounds, and on a railway track scale in grain-weighing service, 50 pounds. The maximum acceptance and adjustment SR allowable on a railway track scale, whether or not it is in grain-weighing service, shall be 50 pounds.

I-2. FOR SMALL-CAPACITY SCALES.—The maximum SR allowable on a small-capacity scale, at the capacity of the scale or at any lesser load, shall be the appropriate value shown in table 1, or the value of two of the minimum weigh-beam graduations, whichever is less: Provided, however, That the manufacturers' maximum allowable SR, or the maximum SR allowable on a new small-capacity scale, shall be one-half the appropriate value shown in table 1, or the value of one of the minimum beam graduations, whichever is less.

TABLE 1.—Maximum Allowable SR on Small-Capacity Scales

Capacity of scale	Maximum SR allowable
<i>Pounds</i>	<i>Ounces</i>
3 or less.....	1/8
4 to 7, inclusive.....	1/4
8 to 14, inclusive.....	1/2
15 to 23, inclusive.....	3/4
24 to 39, inclusive.....	1
40 to 49, inclusive.....	1 1/4
50 to 74, inclusive.....	1 1/2
75 to 89, inclusive.....	2
90 to 99, inclusive.....	2 1/2
100 and over.....	3

I-3. FOR COMPUTING SCALES.—For the maximum SR allowable on a computing scale of such a type that the definition of SR is applicable, see paragraph I-2.

I-4. FOR CREAM-TEST AND BUTTERFAT-TEST SCALES.—The maximum SR allowable on a cream-test or butterfat-test scale shall be 1 grain, or approximately 65 milligrams, when the scale is under maximum load: Provided, however, That the manufacturers' maximum allowable SR, or the maximum SR allowable on a new cream-test or butterfat-test scale, shall be one-half of this value. (In the case of a cream-test scale the maximum load is defined as the weight of the sample used in each bottle multiplied by the number of bottles for which the scale is designed, plus the total tare of these bottles.)

I-5. FOR PRESCRIPTION SCALES AND BALANCES.

I-5a. CLASS A SCALES AND BALANCES.—The maximum SR allowable on a class A prescription scale or balance of a capacity of 1/2 ounce (or 15 grams) or more, at the capacity of the scale or balance or at any lesser load, shall be 0.2 grain (or 13 mg), or the value of two of the minimum weighbeam graduations, whichever is less: Provided, however, That the

manufacturers' maximum allowable SR, or the maximum SR allowable on a new prescription scale or balance, shall be one-half of the value given, or one of the minimum beam graduations, whichever is less. (If any prescription scale or balance has a smaller capacity than $\frac{1}{2}$ ounce—or 15 grams—the maximum SR allowable at the capacity or at any lesser load shall be the same proportionate part of the applicable value specified above that this capacity is of $\frac{1}{2}$ ounce—or 15 grams—or the value of two ⁶ or of one ⁷ of the minimum weighbeam graduations, whichever is less.)

I-5b. CLASS B SCALES AND BALANCES.—The maximum SR allowable on a class B prescription scale or balance, at the capacity or at any lesser load, shall be 0.5 grain: Provided, however, That the manufacturers' maximum allowable SR, or the maximum SR allowable on a new class B prescription scale or balance, shall be one-half the value given.

I-6. FOR PERSON WEIGHERS.—For the maximum SR allowable on beam person weighers see paragraph I-1

⁶ For a scale or balance in use.

⁷ For a new scale or balance.

J. TOLERANCES**J-1. FOR LARGE-CAPACITY SCALES.⁸**

J-1a. FOR LARGE-CAPACITY SCALES EXCEPT RAILWAY TRACK SCALES.—The maintenance tolerances [applicable to scales in use], in excess or deficiency, shall be as follows: For vehicle scales, livestock scales, and coal mine and tippie scales, 2 pounds per 1,000 pounds of test load (0.20 percent) on weighbeam, reading-face, and unit-weight indications, and 1½ pounds per 1,000 pounds of test load (0.15 percent) on ratio; for other scales, the values shown in table 2. The acceptance and adjustment tolerances [applicable to “new” scales as defined in Paragraph A-2q], in excess or deficiency, shall be as follows: For vehicle scales, 1 pound per 1,000 pounds of test load (0.10 percent) on weighbeam, reading-face, and unit-weight indications, and ¾ pound per 1,000 pounds of test load (0.075 percent) on ratio; for other scales, one-half the values shown in table 2. In addition, the above tolerances shall be subject to the following provisos:

1. Except as is provided herein, the tolerance on a beam scale in use shall not be less than the value of one of the minimum beam graduations; on a vehicle scale, in use, when a load of test weights of not less than 8,000 pounds is employed in any test, the tolerance shall not be less than one of the following values: 5 pounds on a scale having a minimum graduation of 2½ pounds or less; 10 pounds on a scale having a minimum graduation of 5 pounds or 10 pounds; 20 pounds on a scale having a minimum graduation of 20 pounds.

2. Except as is provided herein, the tolerance on the reading face of an automatic-indicating scale in use shall not be less than the value of one of the minimum graduations on the reading face, or one five-hundredth of the capacity of the reading face, whichever is less, except that when the minimum graduation on the reading face is 1 pound or more such tolerance shall in no case be less than 1 pound; on an automatic-indicating vehicle scale, in use, when a load of test weights of not less than 8,000 pounds is employed in any test, the tolerance on the reading face shall not be less than one of the following values: 5 pounds on a scale having a minimum reading face graduation of 2½ pounds or

⁸ See also paragraphs B-2w and B-2x.

less; 10 pounds on a scale having a minimum reading face graduation of 5 pounds or 10 pounds; 20 pounds on a scale having a minimum reading face graduation of 20 pounds.

3. On an automatic-indicating scale, in use, the tolerance on any beam and the tolerance on ratio shall not be less than the minimum value specified in the one or the other of the preceding provisos, whichever is less.

4. The tolerance on new scales shall in no case be less than one-half of the tolerance value arrived at by the operation of provisos 1, 2, or 3, except that the special minimum tolerance values specified therein to apply to vehicle scales only, shall not be employed in computing the values of the tolerances on new vehicle scales.

5. In the case of a large-capacity automatic-indicating scale in use exclusively in determining weights for the sole purpose of fixing charges for the transportation of freight, the tolerance shall be twice the tolerance specified above for a scale in use.

6. In the case of a scale of a capacity of more than 60,000 pounds, the value of the minimum tolerance shall in no case be greater than 20 pounds for a scale in use and 10 pounds for a new scale.

TABLE 2.—Maintenance Tolerances for Large-Capacity Scales Except Railway Track, Vehicle, Livestock, and Coal Mine and Tipple Scales

[See also paragraphs B-2w and B-2x]

Load (The amount of known weight on the load-receiv- ing element)	Tolerance on ratio *	Tolerance on weighbeam, reading-face, and unit-weight indications
Pounds	Ounces	Ounces
0 to 99, inclusive.....	1/2.....	1
100 to 199, inclusive.....	2.....	2
200 to 299, inclusive.....	3.....	4
300 to 399, inclusive.....	4.....	6
400 to 499, inclusive.....	5.....	8
500 to 599, inclusive.....	7.....	10
600 to 799, inclusive.....	8.....	12
800 to 999, inclusive.....	11.....	16
1,000 and over.....	3/4 lb per 1,000 lb..	1 lb per 1,000 lb

* The ratio is the multiplying power of the scale. This tolerance is applicable only to parts requiring the employment of counterpoise weights.

J-1b. FOR RAILWAY TRACK SCALES.

J-1b (1). The tolerances for railway track scales not equipped with automatic indicating or recording devices, and for scales normally equipped with these devices but while such devices are detached, shall be as follows:

(a) The maintenance tolerance [applicable to scales in use] for all scales except those in grain-weighing service, shall be ± 0.20 percent of the test load being utilized, applied as follows:

For a scale of more than two sections, to the maximum indicated percentage error of weighing as defined below, but with the added requirement that no individual sectional error shall exceed 0.30 percent of the test load being utilized.

For a scale of more than two sections, to the maximum individual percentage error developed when two or more test loads are applied to the scale at the same time at normal positions not closer together than the distance between adjacent sections.

For a two-section scale, to the maximum individual percentage error developed for any position of the test load or loads.

(b) The maintenance tolerance [applicable to scales in use] for scales in grain-weighing service, shall be ± 0.10 percent of the test load being utilized, applied as follows:

For a scale of more than two sections, to the maximum indicated percentage error of weighing as defined below.

For a scale of more than two sections, to the maximum individual percentage error developed when two or more test loads are applied to the scale at the same time and at normal positions which are farther apart than the distance between adjacent sections.

For a two-section scale, to the maximum individual percentage error developed for any position of the test load or loads.

NOTE.—A scale in grain-weighing service shall be corrected whenever a test discloses an error in excess of 0.10 percent for any position of a test load. (This requirement conforms to the recommendations of the Interstate Commerce Commission—Docket 9009; 56 I. C. C. 347.)

(c) The acceptance and adjustment tolerance [applicable to new or newly reconditioned scales] for all scales shall be ± 0.05 percent of the test load being utilized, applied to the maximum individual percentage error developed for any position of the test load.

J-1b (2). The tolerances for railway track scales in which are embodied or to which are attached automatic indicating or recording devices, for the respective types of scales and conditions of test, shall be the same as those for scales independent of such devices, except as follows:

(a) If the weight is indicated on a reading face, or by means of a printed impression showing the position of an indicating line with reference to a series of graduations, the maintenance tolerance shall not be less than the value of the minimum graduation on the reading face or printed impression, or of $\frac{1}{500}$ of the capacity of the automatic device, whichever is the smaller value, and the acceptance and adjustment tolerance shall not be less than one-half of the minimum specified for the maintenance tolerance.

(b) If the weight indication is a printed record comprising figures only, there shall be added to the tolerance which would otherwise be appropriate an amount equal to 50 percent of the value of the increment between indications that can be printed by the device, or 50 pounds, whichever value is the smaller.

NOTES:

TEST LOADS.—The test loads contemplated to be used consist either of standard test weights carried on a four-wheel truck of known weight, or a railway track scale test weight car or cars, either truck or car to have a wheelbase not exceeding 7 feet. The test load should have a weight of not less than 30,000 pounds.

TEST-LOAD POSITIONS.—A test run comprises normal positions of the test load assumed when each pair of wheels of the truck or of the test car is successively positioned over each section of the scale (except at each end section where only one truck position is possible) except that in the case of a two-section scale an additional position is utilized with the center of the truck midway between the sections.

MAXIMUM INDICATED PERCENTAGE ERROR OF WEIGHING.—The “maximum indicated percentage error of weighing” is computed for scales of more than two sections and is the largest mean value which can be derived from two errors developed during a single test run for positions (1) not closer together than the distance between adjacent sections on all scales except those in grain-weighing service, or (2) farther apart than the distance between adjacent sections on all scales in grain-weighing service.

J-2. FOR SMALL-CAPACITY SCALES EXCEPT UNCOMPENSATED ⁹ SPRING SCALES.¹⁰—The tolerances for small-capacity scales except uncompensated ⁹ spring scales, in excess or deficiency, shall be the values shown in table 3, except that the manufacturers’ tolerances, or the tolerances for new scales, shall be one-half the values shown, and subject, in addition, to the following provisos:

1. On a scale other than an automatic-indicating scale, when the scale is equipped with a weighbeam, the tolerance shall in no case be less than one-half of one of the minimum graduations on the weighbeam; when the scale is not equipped with a weighbeam, the tolerance shall in no case be less than one-half of the actual SR of the scale at the load in question.

2. On an automatic-indicating scale, the tolerance shall in no case be less than the value of one-quarter of one of the minimum graduations on the reading face, except that on new scales it shall in no case be less than the value of one-eighth of one of the minimum graduations on the reading face.

3. The minimum tolerances arrived at by the operation of provisos 1 and 2 shall also apply in the shift test.

⁹ Not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, or not so designed as to be substantially independent of such changes.

¹⁰ See also pars. A-2q, B-2w, and B-2x.

TABLE 3.—Tolerances for Small-Capacity Scales, Except Uncompensated Spring Scales

[See also paragraphs A-2q, B-2w, and B-2x]

Load ^a	Tolerance on ratio ^b	Tolerance on weighbeam or reading face
Pounds	Ounce	Ounce
1.....	1/16.....	1/16
2 and 3.....	1/16.....	1/8
4 to 7, inclusive.....	1/8.....	3/16
8 to 14, inclusive.....	1/4.....	3/8
15 to 23, inclusive.....	5/16.....	1/2
24 to 29, inclusive.....	3/8.....	1/2
30 to 39, inclusive.....	3/8.....	5/8
40 to 49, inclusive.....	7/16.....	5/8
50 to 59, inclusive.....	1/2.....	3/4
60 to 74, inclusive.....	5/8.....	1
75 to 89, inclusive.....	3/4.....	1
90 to 99, inclusive.....	7/8.....	1 1/4
100 and over.....	1 oz per 100 lb.....	1 1/2 oz per 100 lb

^a The amount of known weight on the load-receiving element of the scale.^b The ratio is the multiplying power of the scale. This tolerance is applied to parts requiring the employment of counterpoise weights.

J-3. FOR SMALL - CAPACITY UNCOMPENSATED SPRING SCALES.—The tolerances for small-capacity uncompensated ¹¹ spring scales, in excess or deficiency, shall be the values shown in table 4, except that the manufacturers' tolerances or the tolerances for new scales shall be one-half the values shown: Provided, however, That the tolerance shall in no case be less than one-quarter of the value of one of the minimum graduations on the reading face, except that on new scales it shall in no case be less than one-eighth of such minimum graduation.

¹¹ Not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, or not so designed as to be substantially independent of such changes.

TABLE 4.—Tolerances for Small-Capacity, Uncompensated Spring Scales, Except Straight-Face Spring Scales

[See also paragraphs A-2q, B-2w, and B-2x]

[Tolerances for straight-face spring scales are four times the values shown]

Load ^a	Tolerance	Load ^a	Tolerance
<i>Pounds</i>	<i>Ounces</i>	<i>Pounds</i>	<i>Ounces</i>
1-----	1/8-----	20 to 29, inclusive-----	1 1/2
2 to 3, inclusive-----	1/4-----	30 to 49, inclusive-----	2
4 to 7, inclusive-----	1/2-----	50 to 74, inclusive-----	3
8 to 11, inclusive-----	3/4-----	75 to 100, inclusive-----	4
12 to 15, inclusive-----	1-----	Over 100-----	4 oz per 100 lb

^a The amount of known weight on the load-receiving element of the scale.

J-4. FOR COMPUTING SCALES.—For the tolerances on computing scales see paragraphs J-2 and J-3.

J-5. FOR CREAM-TEST AND BUTTERFAT-TEST SCALES.—The tolerance for cream-test or butterfat-test scales, in excess or deficiency, shall be 1 grain or approximately 65 milligrams: Provided, however, That the manufacturers' tolerance or the tolerance for new scales shall be one-half of this value. In the case of a cream-test scale the tolerance shall be applied on loads of 18 grams each, one of which shall be added when the scale is under approximately the maximum load as defined in paragraph I-4. (See also paragraph E-2c.)

J-6. FOR PRESCRIPTION SCALES AND BALANCES.

J-6a. CLASS A SCALES AND BALANCES.—The tolerances on the ratio of arms of class A prescription scales and balances, in excess or deficiency, shall be the values shown in table 5. If a scale or balance is equipped with a graduated weighbeam, the tolerance at any graduation on the beam shall be the value of the actual SR of the scale or balance at the load in question.

TABLE 5.—Tolerances on Ratio of Arms of Class A Prescription Scales and Balances

Load *		Tolerance on ratio	
<i>Ounces ap</i>	<i>Grams</i>	<i>Grains</i>	<i>Milligrams</i>
1/2-----	15	0. 2	13
1-----	30	. 4	26
2-----	60	. 8	52
4-----	120	1. 6	104
8-----	240	3. 2	208

* The amount of known weight on the load-receiving element of the scale.

(If any prescription scale or balance has a smaller capacity than $\frac{1}{2}$ ounce—or 15 grams—the tolerance to be allowed shall be the same proportionate part of 0.2 grain—or 13 milligrams—that this capacity is of $\frac{1}{2}$ ounce—or 15 grams.)

J-6b. CLASS B SCALES AND BALANCES.—The tolerances on the ratio of arms of class B prescription scales and balances, in excess or deficiency, shall be the values shown in table 6. If a scale or balance is equipped with a graduated weighbeam, the tolerance at any graduation on the beam shall be 0.3 grain—or 20 milligrams—unless this value is less than that of the actual SR of the scale at the load in question, in which case the value of this actual SR shall be used as the tolerance at any graduation on the beam.

TABLE 6.—Tolerances on Ratio of Arms of Class B Prescription Scales and Balances

Load *		Tolerance on ratio	
<i>Ounces ap</i>	<i>Grams</i>	<i>Grains</i>	<i>Milligrams</i>
1/2-----	15	0. 5	30
1-----	30	1. 0	65
2-----	60	2. 0	130
4-----	120	4. 0	260
8-----	240	8. 0	520

* The amount of known weight on the load-receiving element of the scale.

(If any class B prescription scale or balance has a smaller capacity than $\frac{1}{2}$ ounce—or 15 grams—the tolerance to be allowed shall be the same proportionate part of 0.5 grain—or 30 milligrams—that this capacity is of $\frac{1}{2}$ ounce—or 15 grams.)

J-7. FOR PERSON WEIGHERS.—For the tolerances on person weighers see paragraph J-1.

J-8. FOR WHEEL-LOAD WEIGHERS.—The tolerance for wheel-load weighers shall be 5 percent, in excess or deficiency, of the load applied: Provided, however, That the manufacturers' tolerance, or the tolerance for new wheel-load weighers, shall be 3 percent, in excess or deficiency, of the load applied: And provided further, That this latter tolerance shall also be applied to wheel-load weighers which are being retested after having been found inaccurate and subsequently adjusted or repaired. When wheel-load weighers are tested in pairs, the tolerance shall be applied to the sum of the indications of the two weighers and both shall be approved or condemned upon the sum of their indications; in this case each of the pair of weighers shall be appropriately marked to identify the pair tested together.

K. GENERAL REGULATIONS

K-1. LADING.

K-1a. MAXIMUM.—A scale shall not be used for weighing loads greater than its nominal or rated capacity.

K-1b. MINIMUM ON VEHICLE AND LIVESTOCK SCALES.—A vehicle scale or a livestock scale shall not be used for weighing loads of less than 1,000 pounds.

K-2. STRAIGHT AND LEVEL APPROACHES.—A vehicle scale shall have at least 12 feet of straight driveway at either end of the scale in the same plane as the platform.

K-3. BALANCE CONDITION.—A scale shall be maintained in balance.

K-4. LEVEL CONDITION.—A scale which is portable and which is being used on a counter or table or on the floor shall be maintained in level.

K-5. FREE SUSPENSION.—A scale of the hanging type shall be freely suspended when in use.

K-6. WEIGHT GRADUATIONS ON SCALES.

K-6a. FOOD SCALES.—The value of the minimum weight graduations on a scale equipped with a weighbeam or reading face, used in the sale of foodstuffs at retail, shall not exceed 1 ounce: Provided, however, That this shall not apply to a scale used exclusively in the sale of fruits and/or vegetables. *A spring scale not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, or not so designed as to be substantially independent of such changes, shall not be used in the retail sale of foodstuffs other than fruits and vegetables.*

K-6b. VEHICLE SCALES.—*The value of the minimum weight graduations on the weighbeam and/or on the reading face of a vehicle scale having a capacity of not more than 60,000 pounds shall not exceed 20 pounds.*

K-6c. LIVESTOCK SCALES.—The value of the minimum weight graduations on the weighbeam and/or on the reading face of a livestock scale shall not exceed 5 pounds.

K-7. DRAINAGE.—Wet fish or other wet commodities shall be weighed only on scales the pan or platform of which will properly drain.

K-8. USE OF CLASS B PRESCRIPTION SCALE OR BALANCE.—A class B prescription scale or balance shall only be used in a drug store provided with a class A prescription scale or balance, and shall only be used for the weighing of loads of 10 grains or more.

K-9. READABILITY OF INDICATION ON PERSON WEIGHERS.—A ticket person weigher shall be so maintained in use that all statements or representations of weight printed, stamped, or otherwise transferred on or to the weight ticket during operation shall be clear and distinct.

K-10. OWNER OF PERSON WEIGHER TO BE IDENTIFIED.—A person weigher shall be permanently and legibly marked with a statement containing the name and address of the person, firm, or corporation responsible for placing the person weigher in service, in combination with some such words as "Operated by", "Maintained by", etc.: Provided, however, That such statement shall not be required when the person weigher is in service on the premises of such person, firm, or corporation.

K-11. LENGTHENING OF SCALE PLATFORMS.—The length of the platform of a vehicle scale shall not be increased beyond the manufacturer's designed dimension except when the modification has been approved by competent scale-engineering authority, preferably that of the engineering department of the manufacturer of the scale, and by the weights and measures authority having jurisdiction over the scale.

WEIGHTS

SPECIFICATIONS

1. Weights shall be made of steel, iron, brass, or any other metal or alloy of metals not softer than brass: Provided, however, That weights below $\frac{1}{4}$ ounce shall not be made of iron or steel, but may be made of aluminum.

2. Weights shall have smooth surfaces, and no weight of more than 1 gram, 1 pennyweight, or 1 scruple shall have sharp points or corners.

3. Weights shall not be covered with a soft or thick coat of paint or varnish.

4. All holes in which foreign material is to be placed for adjusting purposes shall be of such form that the material will be permanently and securely held in place. In no case shall this adjusting material project beyond the surface of the weight.

5. Rings on weights shall not be split or removable.

6. All weights shall be clearly marked with their nominal value, *and in addition weights intended for use on multiplying-lever scales shall be clearly marked with the value they represent when used upon the scale for which they are intended.* Provided, however, That the values of weights of less than 1 gram, 1 pennyweight, or 1 scruple may be designated by dots, lines, figures, distinctive shape, or other appropriate means.

TOLERANCES

The tolerances to be allowed in excess or deficiency on commercial avoirdupois weights shall be the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on new commercial avoirdupois weights shall be one-half of the values given.

Tolerances for Commercial Avoirdupois Weights

Weight	Tolerance, weights for equal- arm scales	Tolerance, counterpoise weights for multiplying- lever scales
<i>Pounds</i>	<i>Grains</i>	<i>Grains</i>
50-----	100.0	-----
25-----	70.0	-----
20-----	60.0	-----
15-----	40.0	-----
10-----	40.0	20.0
8-----	30.0	18.0
5-----	25.0	13.0
4-----	25.0	12.0
3-----	20.0	10.0
2-----	15.0	8.0
1-----	10.0	5.0
<i>Ounces</i>		
10-----	8.0	4.0
8-----	7.0	3.0
5-----	5.0	2.0
4-----	4.0	2.0
2-----	3.0	1.0
1-----	2.0	1.0
1/2-----	2.0	1.0
1/4-----	1.0	-----
1/8-----	0.5	-----
1/16-----	.5	-----
1/32-----	.5	-----
1/64-----	.2	-----

The tolerances to be allowed in excess or deficiency on apothecaries' prescription weights shall be the values shown in the two following tables: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on new apothecaries' prescription weights shall be one-half of the values given.

Tolerances for Prescription Weights in Apothecaries' System

Weight	Tolerance	Weight	Tolerance
<i>Ounces ap</i>	<i>Grains</i>	<i>Scruples</i>	<i>Grains</i>
12-----	4.0	3-----	0.3
10-----	4.0	2-----	.25
8-----	3.0	1-----	.15
5-----	3.0		
		<i>Grains</i>	
4-----	2.0	20-----	.15
3-----	2.0	10-----	.12
2-----	2.0	5-----	.08
1-----	1.0	2-----	.04
<i>Drams ap</i>		1-----	.03
8-----	1.0	0.5-----	.02
6-----	1.0	.2-----	.015
4-----	0.7	.1-----	.01
3-----	.6		
2-----	.5		
1-----	.3		
0.5-----	.2		

Tolerances for Prescription Weights in Metric System

Weight	Tolerance	Weight	Tolerance
<i>Grams</i>	<i>Milligrams</i>	<i>Milligrams</i>	<i>Milligrams</i>
500-----	350	500-----	7
200-----	200	200-----	4
100-----	150	100-----	3
50-----	100	50-----	2
20-----	50	20-----	1
10-----	40	10-----	1
5-----	25		
2-----	15		
1-----	10		

The tolerances to be allowed in excess or deficiency on weights to be used in connection with cream-test and butter-fat-test scales and moisture-test scales shall be 20 milligrams on the 18-gram weight and 10 milligrams on the 9-gram and 10-gram weights: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on new weights shall be one-half the values given.

The tolerances to be allowed in excess or deficiency on commercial troy weights shall be the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on new commercial troy weights shall be one-half of the values given.

Tolerances for Commercial Troy Weights

Weight	Tolerance	Weight	Tolerance
<i>Ounces troy</i>	<i>Grains</i>	<i>Pennyweights</i>	<i>Grain</i>
12-----	4.0	10-----	0.7
10-----	4.0	5-----	.5
8-----	3.0	4-----	.4
5-----	3.0	3-----	.3
4-----	2.0	2-----	.25
3-----	2.0	1-----	.15
2-----	2.0		
1-----	1.0		

GENERAL REGULATIONS

1. POSITION OF WEIGHING OR MEASURING DEVICE.—A weighing or measuring device used in retail trade, except as used exclusively in the preparation of packages put up in advance of sale, shall be so positioned that its indications may be accurately read, and the weighing or measuring operation observed, from some reasonable "customer" position. (The permissible distance between the device and a reasonable customer position will depend upon the size and character of the indicating elements of the device.)

CORRECTION SHEETS

The National Bureau of Standards plans to issue from time to time printed sheets showing changes in and additions to the codes published in this Handbook. These correction sheets will be printed to conform with the text of this publication.

In many cases it will be found practicable to attach a portion or all of a correction sheet directly at that point in the original text where the change is to be made; this method of making corrections is recommended. In any event, each correction should be promptly inserted in the Handbook and suitable notation should be made adjacent to the original of the modified text, or at the proper point for insertion of new material, directing attention to the change; blank pages are included at numerous points following codes or major subdivisions thereof, to facilitate the pasting-in of corrections to material immediately preceding.

Correction sheets will be supplied without charge. The distribution will be made automatically to the regular weights and measures mailing list of the Bureau. Purchasers of one or more copies of Handbook H29 may receive the number of correction sheets needed by addressing to the National Bureau of Standards, Washington, D. C., for the attention of Division II-7, a request to be placed on the mailing list for correction sheets for Handbook H29, specifying the number of such sheets required.

